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STUDIES ON THE COMPARATIVE PHYSIOLOGY OF AGING

II. On the Mechanism of Temperature Life-Shortening in *Drosophila Melanogaster*

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Forty-three years ago Loeb and Northrop (8) published their classical paper on the influence of food and temperature on the duration of life in *Drosophila melanogaster*. Using aseptic animals they conclusively demonstrated that the process of aging in *Drosophila* is markedly accelerated by keeping them at temperatures in the upper range compatible with their existence and that life is greatly prolonged by lowering environmental temperature. This work was followed by a more intensive series of studies by Alpatov and Pearl (1), which was reported in 1927-28. Alpatov and Pearl confirmed the original results of Loeb and Northrop and showed, in addition, that the lifespan of the imago at a given temperature was influenced by the temperature at which larval and pupal development had occurred. Moreover, their study showed that flies reared through the larval period at 18 C. exhibited longer mean lifespans than those reared at 25 C. This was the case whether the flies were kept during the adult period at 18, 25, or 28 C. This greater vigor of flies which were reared at 18 C. during the larval and pupal stages was found to be correlated with a general increase in size as measured by a number of precise anatomical indices, such as length of thorax, length and breadth of wings.

The present experiments were designed to furnish data on the mechanism of temperature effects on life-shortening which were not implicit in the earlier studies. An enumeration of the possible general mechanisms by which temperature could affect the aging process (18) results in three general categories.

First, at high temperatures there may be an increased rate of loss of thermo-sensitive structural and functional elements, such as cells, enzymes, and nucleoproteins. The second alternative is that the rate of utilization or destruction of some limiting non-replaceable metabolite, catalyst, or co-factor is increased by normal pathways at higher temperatures. This is consistent with the first of the possibilities enumerated by Loeb and Northrop to be discussed below. The final possibility is that there is an increased rate of accumulation of some deleterious factor at the higher temperatures. These experiments were designed to test the applicability of the first hypothesis. They are based on the fact that the activation energy for the protein denaturative processes and for the destruction of other important biological constituents, such as DNA, exhibit extremely high temperature coefficients, whereas the reactions involved in substrate utilization or in the formation of metabolic by-products generally show much lower temperature coefficients. Accordingly, in the present experiments flies were exposed for a brief period (about one hour) to temperatures at the upper limit consistent with life of the *Drosophila*. These animals were then returned to a more optimal temperature and their subsequent mortality was observed on successive days. If the exposure to higher temperatures (which incidentally resulted in 50% mortality within three days of exposure) accelerated changes identical with those involved in the normal aging processes, then it would be expected that the surviving flies would show a mortality rate characteristic of older control flies.

The present studies show that this is indeed not the case. Rather, the heat-shocked animals which survived the initial recovery period show an identical mortality behavior to control flies of the same age. It may thus be concluded that the normal aging process does not entail reactions with extremely high activation energies and therefore that protein or nucleoprotein denaturation is not the limiting mechanism of normal aging in these animals. In this species, aging must therefore involve either a destruction of some limiting factor by processes with the low activation energies characteristic of catalyzed reactions, the accumulation of harmful substances through the operation of similar reactions, or a disruption of structure as a by-product of reactions with ordinary activation energies, that is, micro-chemical accidents.

*D. melanogaster** were cultured on corn meal agar medium in half-pint cotton stoppered bottles according to usual procedures. Cultures were started by placing 25 to 50 males and females into culture bottles and allowing the females to lay eggs for a period of 5 to 7 days. The parent flies were then removed and those flies emerging during a 12-hour period (usually overnight) were used for the aging studies. Transfers were made in a sterile hood in order to avoid contamination with molds and bacteria from the environment. The flies harvested every morning were mildly anaesthetized with ether and then spread out on a Petri plate containing the following three components in stratified layers: The lowest layer consisted of about 2 mm. of sterile sea sand. Over this was placed a 5 mm. thick layer of modeling clay. Plates were sterilized by autoclaving at this stage and, after cooling, a 7 mm. layer of corn meal agar medium (see table 1) was poured over them and allowed to harden under sterile conditions.

Because of the fact that population density has a striking influence on the lifespan of *Drosophila* (12), an effort was made to eliminate this variable. The flies were individually housed in small glass tubes (2 inch lengths of glass tubing of 7 mm. bore) containing a cotton plug at one end. In order to house the fly it was simply necessary to push the previously sterilized and stoppered pieces of tubing around the fly through the nutrient medium, through the modeling clay, into the sand and then remove them. Flies thus enclosed on a complete medium were protected from contamination by the cotton stopper and by the modeling clay plug which sealed the bottom of the tube. They were kept in plastic-covered sandwich boxes, with removable airtight covers in a constant temperature incubator (Precision Scientific, Model 805).

Every morning the boxes were observed. The tubes containing flies that had died during the previous 24 hours were removed and records kept of the numbers dying at each age.

Flies were exposed for variable periods of time to high temperatures by immersing the lower three-fourths of the tubes in a constant temperature water bath for the prescribed period and then returning them to the sandwich boxes.

The data were analyzed in several ways. The percentage survival was plotted vs. age according to conventional methods. In addition, the mortality rate was calculated for each age (mortality rate = number dying per unit time divided by number alive at beginning of time period). Survivorship vs. age was plotted on linear paper; log of mortality rate and log survivorship vs. age were plotted on semi-log paper. Gompertz slopes (4, 18) and survival curves were fitted by eye.

In all experiments the flies emerging on a given day were divided into two groups in order to compensate for any potential systematic variation in mortality behavior due to changes in the genetic characteristics of the fly populations. No such variation was evident in our studies. The present results were obtained over a two-year period and involved some 15,000 individually-housed flies.

RESULTS

A. Mortality Behavior of Drosophila at Various Ambient Temperatures.—In order to establish the appropriateness of the present culture method to the problem at hand, the normal mortality behavior of *Drosophila* at different temperatures was tested with large numbers of

TABLE 1. *Drosophila* MEDIUM.

White corn meal	100 Gm.
Dextrose	100 Gm.
Brewer's yeast	10 Gm
Agar agar	5 Gm.
Tegosept-M (Methyl p-Hydroxybenzoate)	3 Gm.
Distilled water	625 cc.

The above ingredients were mixed and cooked until slightly thick, then sterilized in autoclave for 20 min. at 120-140 C. at 15-18 lbs. pressure.

* Obtained through the courtesy of Dr. H. Bentley Glass.

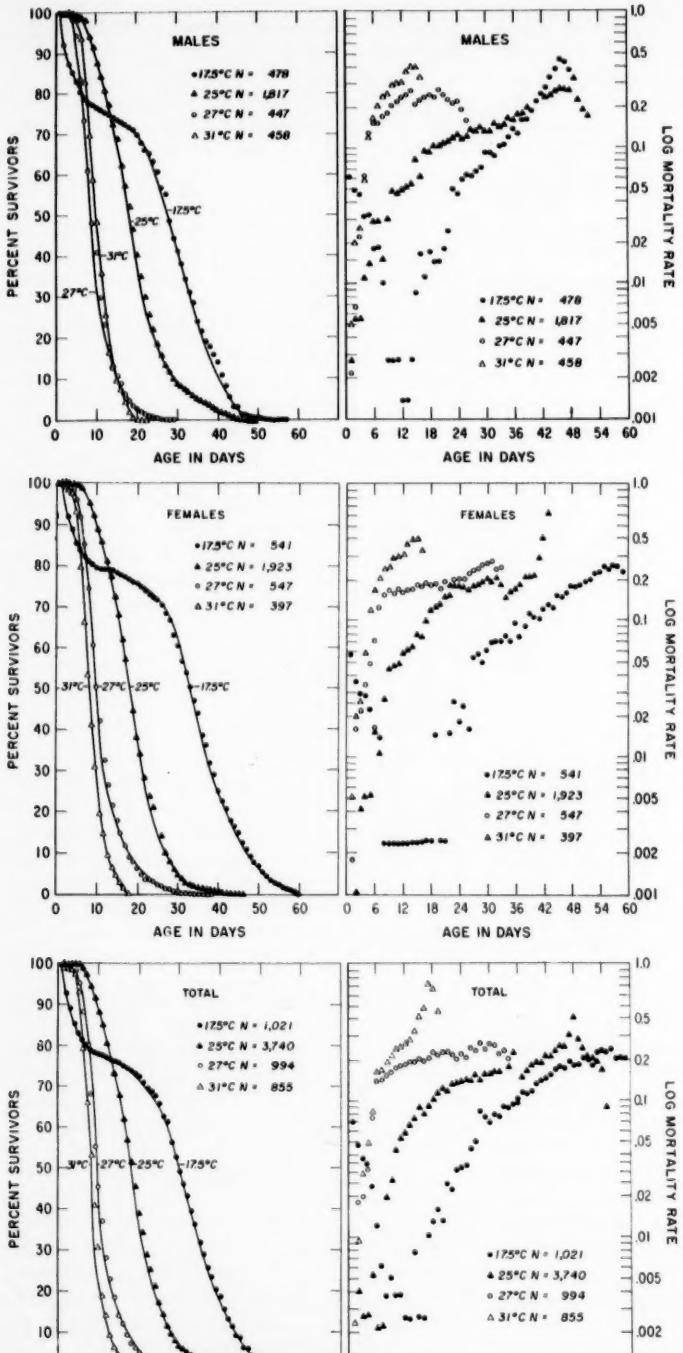

Fig. 1. Survivorship and Gompertz plots for *D. melanogaster* at various temperatures. Top: Males; middle: Females; bottom: Total.

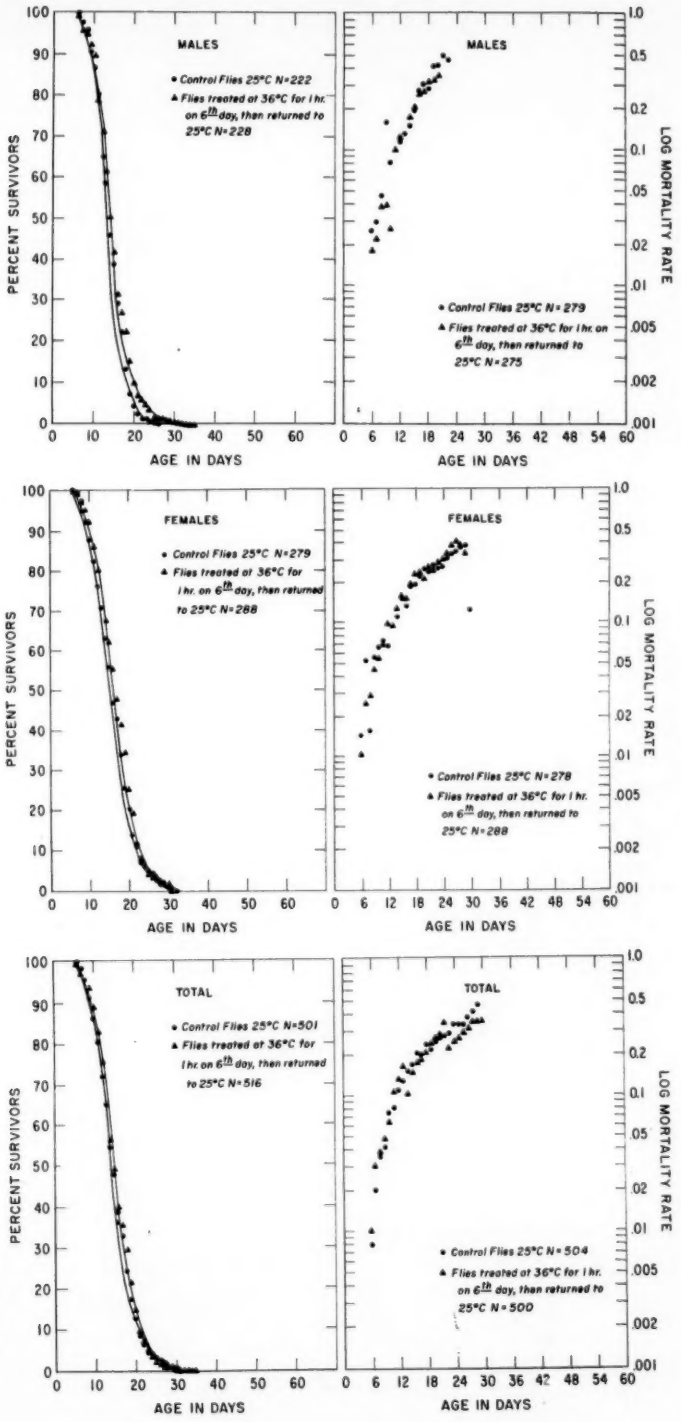
MALES
• Control Flies 25°C N=222
▲ Flies treated at 36°C for 1 hr. on 6th day, then returned to 25°C N=228
MALES
• Control Flies 25°C N=279
▲ Flies treated at 36°C for 1 hr. on 6th day, then returned to 25°C N=275
PERCENT SURVIVORS
LOG MORTALITY RATE
AGE IN DAYS
AGE IN DAYS
FEMALES
• Control Flies 25°C N=279
▲ Flies treated at 36°C for 1 hr. on 6th day, then returned to 25°C N=288
FEMALES
• Control Flies 25°C N=278
▲ Flies treated at 36°C for 1 hr. on 6th day, then returned to 25°C N=288
PERCENT SURVIVORS
LOG MORTALITY RATE
AGE IN DAYS
AGE IN DAYS
TOTAL
• Control Flies 25°C N=501
▲ Flies treated at 36°C for 1 hr. on 6th day, then returned to 25°C N=516
TOTAL
• Control Flies 25°C N=504
▲ Flies treated at 36°C for 1 hr. on 6th day, then returned to 25°C N=500
PERCENT SURVIVORS
LOG MORTALITY RATE
AGE IN DAYS
AGE IN DAYS

Fig. 2. Survivorship and Gompertz plots for *D. melanogaster* at 25 c. (exposed to 36 C. for one hour at 6 days of age). Top: Males; middle: Females; bottom: Total.

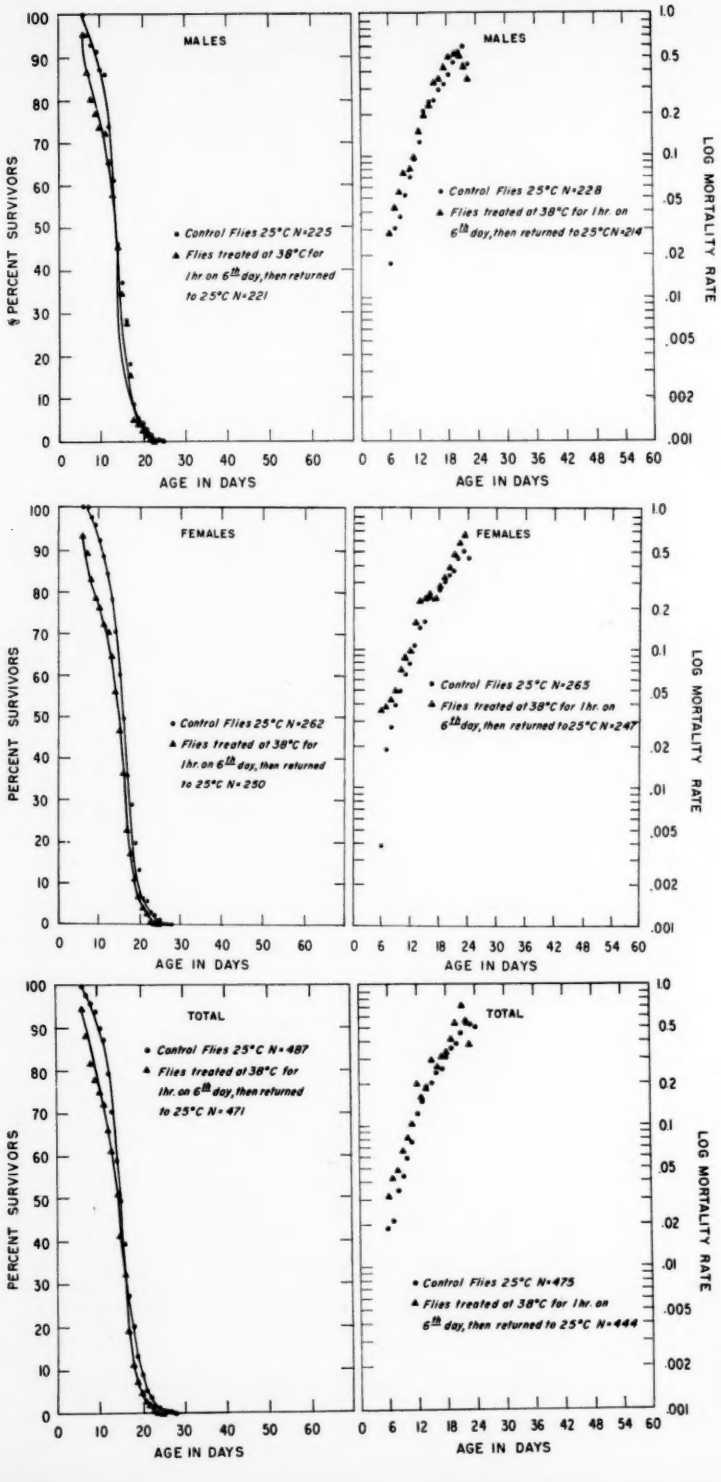
MALES
• Control Flies 25°C N=225
▲ Flies treated at 38°C for 1hr on 6th day, then returned to 25°C N=221
MALES
• Control Flies 25°C N=228
▲ Flies treated at 38°C for 1hr. on 6th day, then returned to 25°C N=214
% PERCENT SURVIVORS
LOG MORTALITY RATE
AGE IN DAYS
FEMALES
• Control Flies 25°C N=262
▲ Flies treated at 38°C for 1hr. on 6th day, then returned to 25°C N=250
FEMALES
• Control Flies 25°C N=265
▲ Flies treated at 38°C for 1hr. on 6th day, then returned to 25°C N=247
PERCENT SURVIVORS
LOG MORTALITY RATE
AGE IN DAYS
TOTAL
• Control Flies 25°C N=487
▲ Flies treated at 38°C for 1hr. on 6th day, then returned to 25°C N=471
TOTAL
• Control Flies 25°C N=475
▲ Flies treated at 38°C for 1hr. on 6th day, then returned to 25°C N=444
PERCENT SURVIVORS
LOG MORTALITY RATE
AGE IN DAYS

Fig. 3. Survivorship and Gompertz plots for D. *melanogaster* at 25 C. (exposed to 38 C. for one hour at 6 days of age). Top: Males; middle: Females; bottom: Total.

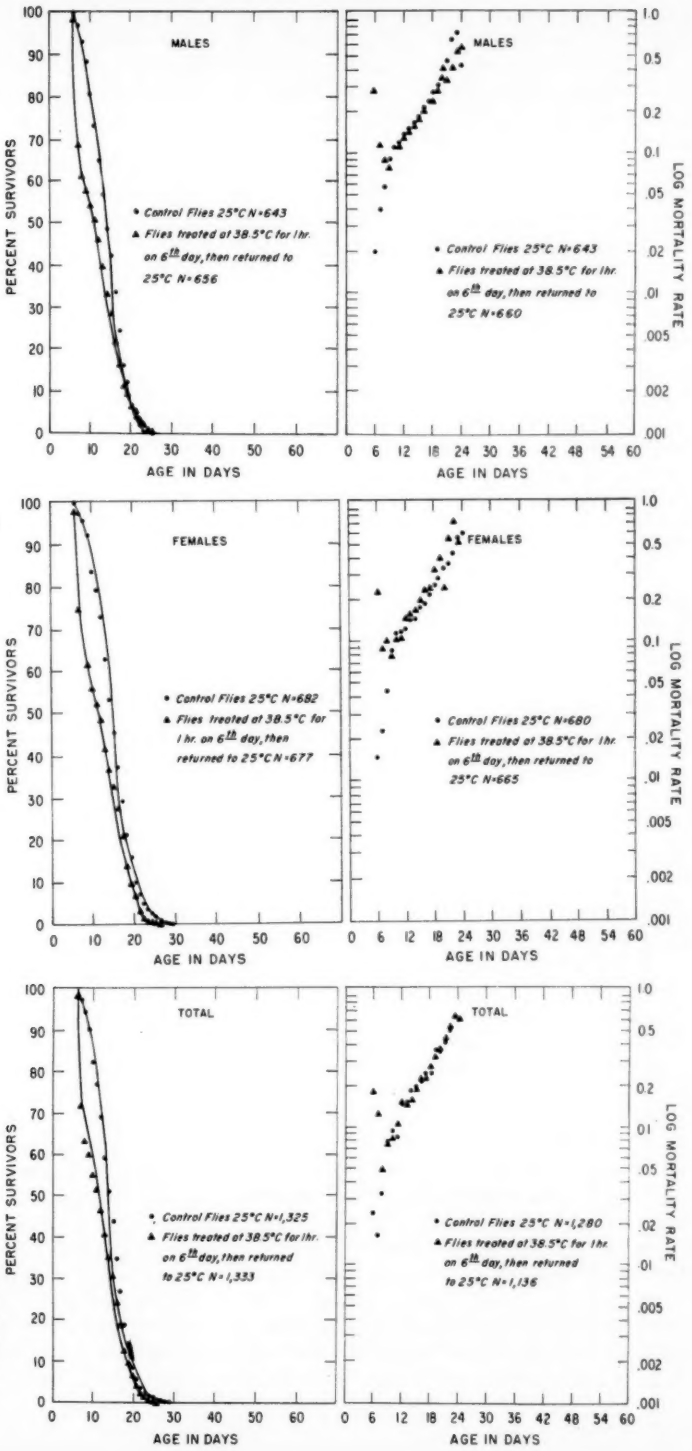
MALES
PERCENT SURVIVORS
AGE IN DAYS
• Control Flies 25°C N=643
▲ Flies treated at 38.5°C for 1hr. on 6th day, then returned to 25°C N=656
MALES
LOG MORTALITY RATE
AGE IN DAYS
• Control Flies 25°C N=643
▲ Flies treated at 38.5°C for 1hr. on 6th day, then returned to 25°C N=660
FEMALES
PERCENT SURVIVORS
AGE IN DAYS
• Control Flies 25°C N=682
▲ Flies treated at 38.5°C for 1 hr. on 6th day, then returned to 25°C N=677
FEMALES
LOG MORTALITY RATE
AGE IN DAYS
• Control Flies 25°C N=680
▲ Flies treated at 38.5°C for 1hr. on 6th day, then returned to 25°C N=665
TOTAL
PERCENT SURVIVORS
AGE IN DAYS
• Control Flies 25°C N=1,325
▲ Flies treated at 38.5°C for 1hr. on 6th day, then returned to 25°C N=1,333
TOTAL
LOG MORTALITY RATE
AGE IN DAYS
• Control Flies 25°C N=1,280
▲ Flies treated at 38.5°C for 1hr. on 6th day, then returned to 25°C N=1,136

Fig. 4. Survivorship and Gompertz plots for *D. melanogaster* at 25 C. (exposed at 38.5 C. for one hour at 6 days of age). Top: Males; middle: Females; bottom: Total.

individually-housed flies. The results of these studies are illustrated in figure 1a, 1b, and 1c, which show the survivorship curves as well as the Gompertz plots. The Gompertz slopes extractable from these plots gave an intercept of .0014 and a doubling time of one day at 25 C. One feature of these curves should be noted in particular. Although small populations seem to behave according to strict Gompertz function, it is apparent, when very large populations of several thousand flies are used, that the rate of increase of mortality decreases at great ages so that the initial high rate of increase in mortality rate is somewhat diminished. The possibility that this low slope at advanced ages (which incidentally is also characteristic of the Gompertz plot of human populations at great ages) (10, 21, 22) is due to a distortion of the curve by selective survival of specially resistant individuals, was tested by plotting separately those batches of flies which possessed survivors beyond the age of 30 days at 25 C. These mortality rate plots did not differ significantly from the total population. The above results are consistent in all respects with those reported earlier by Loeb and Northrop and by Pearl, as to the relative effect of temperature on lifespan. Our flies, however, were somewhat more short-lived at 25 C. than those reared by Alpatov and Pearl and by Loeb and Northrop. Whether this is a function of the medium on which our flies were kept, of the population density we used as compared to theirs, or of other unexplored factors cannot, at present, be answered.

B. Comparison of Mortality Behavior of Thermally-Shocked Flies and of Control Flies.—Batches of flies kept to 5 days of age at 25 C. in individual cages were exposed for various periods of time to different temperatures and then returned to 25 C. for the remainder of their lives. The length of exposure and the temperature required to produce an effect were arrived at empirically. It was found that the exposure at 36, 37, and 38 C. produced practically no post-exposure mortality and that in all respects the flies behaved mortality-wise during the rest of their lives indistinguishably from the controls. Within 36 hours after exposure to 39 C. for one hour about 95% of the flies had died.

At a temperature of 38.5 C. for one hour a small number of the flies died during the exposure period but about 50% died within 3-5 days of the exposure. However, after the initial high mortality following exposure, the surviving flies exposed at 38.5 C. and returned to 25 C. did not show any difference in their mortality behavior as compared to their controls which had not be exposed. The results obtained at various test exposure temperatures are illustrated in figures 2, 3, and 4 and should be compared with the 25 C. results shown in figure 1.

DISCUSSION

The above results clearly demonstrate that the rate-limiting factors in the normal aging of *D. melanogaster* possess low activation energies. This conclusion was not directly deducible from the temperature studies of Loeb and Northrop (8) and of Alpatov and Pearl (1), because it is possible that energetic chemical reactions taking place at an increasing rate at higher temperatures might have produced denaturative processes in the enzymatic constitution of critical cells in these animals. That such energetic reactions are not responsible for the normal aging of these animals is indicated by the fact that exposure to high temperatures for a brief period does not age animals of this species.

Loeb and Northrop (8) had concluded from their studies that the "duration of life is determined by the production of a substance leading to old age and natural death, or by the destruction of a substance or substances which normally prevent old age and natural death." They postulated that this substance was accumulated or utilized according to a law relating rate and temperature that resembled that of a chemical reaction, i.e., a Q_{10} between 1.5 and 3.

Alpatov and Pearl (1), on the other hand, basing their interpretations upon their own experiments came to a somewhat different conclusion. Their "alternative explanation is biological in its essence rather than chemical. It is a simple fact of observation that the total activity of *Drosophila* is greater at higher temperatures and lesser at lower temperatures. . . . It is in accord with the results of the body of carefully controlled experimental work cited to suppose that the reason . . . *Drosophila* has a shorter duration of imaginal life at higher temperatures is primarily simply because it is more active at those temperatures or, in other words, has a higher 'rate of living' and consequently shorter absolute duration of life." It should be noted that the Alpatov and Pearl conclusion is essentially identical with the first

of the alternatives stated by Loeb and Northrop (utilization of some limiting substances).

Studies during the last decade by Smith and associates (5, 14, 15, 16, 17) has brought to light some additional facts. Smith has shown among other things that adult female flies (but not males) kept at temperatures somewhat above their optimum for half of their adult life expectancy at that temperature actually live longer when returned to the lower temperatures than animals kept at the lower temperatures throughout their youth. Smith demonstrated that this effect was probably due to a decreased fertility by several elegant experiments. The fertility of flies at higher temperatures is greatly reduced. It may well be, however, that Smith's observations are not relevant to an intrinsic aging process but, rather, reflect an indirect effect on survival capacity, since it would be expected that flies which are unburdened by the extra metabolic work associated with egg laying would be less taxed physiologically than flies carrying a normal burden of egg laying. The probability of dying and consequently the mean survival time are the resultant of the interaction of an organism and its environment, and sterilized flies live in a different environment (in the sense that they are not exposed to the rigors of reproduction). This conclusion is consistent with the results observed by Gowan (5) on the survival of female mice exposed to varying dosages of ionizing radiation. Gowan's studies show that if a radiation dosage is given which is sufficient to sterilize or reduce the fertility of female mice there is a corresponding increase in the survival time.

A basic criticism of all of the above findings should be pointed out. Life duration is a measure of many environmental factors, in addition to an intrinsic aging process. A more explicit measure of the rate of aging is given by the application of the mathematical expression formulated by Gompertz in 1825 (4). This Gompertz function has been applied to the study of mortality in populations and to the effect of various environmental factors on aging. In human beings, for example, the mean longevity is greatly affected by environmental factors which operate largely to produce high infant mortality. The probability of survival after adulthood is reached is much less affected by variation in environment. The Gompertz function, rather than calling attention to the mean age at death, emphasizes the rate of increase of mortality (i.e., probability of death) and, as such, it seems to be a more reliable measure of the rate of aging. Unfortunately, the experiments of Loeb and Northrop involved too few individual flies to permit one to derive meaningful mortality rates at various ages upon which a Gompertz analysis could be based. The work of Alpatov and Pearl (1), while embracing a larger number of experimental animals, gave Gompertz plots at gross variance with other mortality statistics developed by Pearl and Miner (11) for *Drosophila* and may, therefore, have been subject to some systematic experimental error. The data of Smith, like that of Loeb and Northrop, is not sufficiently extensive to permit a calculation of mortality rate at different ages.

On the basis of a comparison of the temperature dependence of lifespan, Smith has also concluded that the reactions occurring above 30 C. which produce life-shortening are different from those occurring at more optimal temperatures for these organisms. The present experiments establish on a more solid basis the thesis that normal aging is not a high activation process and that it has little to do with the rapid increase in mortality observed above 30 C. by Smith and others.

The effects of temperature on longevity in a number of animal species (3, 9) including *Drosophila* (1, 8, 15) are summarized in figures 5 and 6. All rates were normalized to the rate at 17-19 C. for interspecific comparison. The activation energy for the aggregate calculated is 18,400 cal., which is consistent with the low activation energy for the process deduced from the present experiments.

The nature of the factors responsible for the decreased viability of old *Drosophila* remains obscure. Whether aging in these organisms (which unlike many other invertebrates and vertebrates do not have a regular cell replacement cycle except in the germ cell line) is a consequence of the loss of important cellular constitutents with the passage of time (18), whether it involves the accumulation of waste products or other noxious substances (by analogy with the accumulation of lipofuscin age pigments in humans and other vertebrate forms) (6, 13, 20) or whether the decreased viability is a result of cell loss or organ and tissue disorganization or damage must await further studies, anatomical and physiological.

Unfortunately, the elegant studies of Levenbook and Williams (7) on age changes in the mitochondria of flight muscles in *Drosophila*

and the influence of such changes on the wing beat frequency of flies has not been extended to older flies. In their studies there was a gradual increase in the cytochrome c content of the flight muscles of phormia. This cytochrome content was directly related to the wing beat frequency and reached a steady level after about 7 days of adult life after which it remained constant up to 15 days of age, the greatest age examined in these studies. The earlier studies of Williams and associates (23) may be more germane to the present study.

In retrospect it is not surprising that poikilotherms generally seem to age more rapidly at elevated temperatures and conversely more slowly at low temperatures, since any chemical reaction would be expected to show a temperature dependence. In organisms which fail to possess means of counteracting by repair or replacement those changes in vital organs or cells occurring during the aging process, we would expect these aging processes to be accelerated

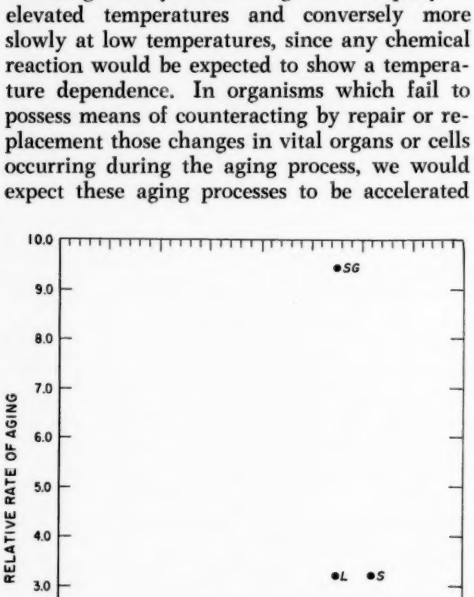

Fig. 5. Relative rate of mortality for a number of animal species normalized to 20 C.
L = Loeb and Northrop (8), *Drosophila melanogaster.*
A = Alpatov and Pearl (1), *Drosophila melanogaster.*
S = Present results (50% mortality), *Drosophila melanogaster.*
MS = Maynard Smith (15), *Drosophila subobscura.*
E = Ewer and Ewer (3) *Pinus tectus* Boie.
M = MacArthur and Bailley (9), *Daphnia magna.*
SG = Present results, Gompertz slopes.

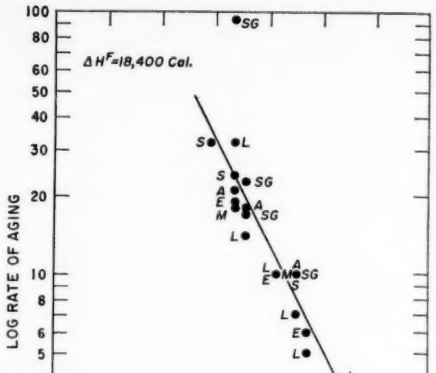

Fig. 6. Arrhenius plot of data given in legend to figure 5—same symbols.

at high temperatures. Whether or not a similar temperature relationship would be characteristic of homeothermic animals is an interesting object for future study because, provided that some means could be found to compensate for the decrement in limiting physiological functions as an homeotherm is cooled down, it might be possible to produce a very considerable increase in longevity.

The possibility may also be considered that the greater longevity of poikilothermic animals at low temperatures may itself be a factor possessing survival value in evolutionary selection, for there is a great advantage to a species in having individuals so adapted that they can survive the periods of lower nutrition which usually are associated with the onset of colder weather. Thus the decreased rate of aging at low temperatures might well be a directly selected character rather than an accidental by-product of a structure containing catalysts with normal temperature dependences. Stated otherwise there may actually be genes which are called into actions at lower temperatures so as to suppress the rate of normal deteriorative processes.

Finally, there exists the possibility that the aging process in lower forms bears little rela-

tionship to the process as it occurs in vertebrates. In many obvious respects *Drosophila* aging is not directly comparable to human aging. For one thing, the lifespan of humans is nearly 1,000 times greater than that of *Drosophila* (37 C. and 25 C. respectively); for another the imaginal existence of *Drosophila* starts in a nearly fully developed state, whereas vertebrates generally undergo a long post-natal development leading to the reproductively functional adult. Third, the evolutionary origin of arthropods is so far removed from that of the vertebrates that it might be considered unreasonable to expect similar mechanisms for senescence to be operating.

On the other hand, there are several factors which make plausible a considerable resemblance between the aging process in *Drosophila* and in humans. The first of these is the fact that aging in vertebrates takes place primarily in those cell lines and tissues which are not subject to regular replacement and repair processes (18, 19). In those cells, such as the blood-forming elements, skin, and the lining of the gut where a regular replacement cycle is of evolutionary selective advantage by virtue of high attrition rate of cells and subcellular components, no pronounced characteristic age changes are observable. From this point of view, *Drosophila* may be considered as a vertebrate stripped of its replaceable cell lines and thus may represent an idealized form of the latter type of organism consisting only of cells capable of aging.

A second argument concerning the possible relationship of the basic aging process in *Drosophila* and in humans is to be found in considerations of a more general nature derived from evolutionary concepts. As Comfort (2) has noted, it is quite possible that senescence in various forms may have a great deal in common because there is, after all, an underlying similarity in the basic organization of cells and tissues, even in such disparate forms. Natural selection may through convergence yield gross senescent patterns which have more than a passing resemblance to each other. Experimentally, this question could probably best be resolved by producing poikilothermic mammals and observing the effects of temperature on longevity, but this attack will have to await the development of appropriate technical advances and understanding of the mechanisms controlling thermo-regulation in mammals.

SUMMARY

The effect of temperature on the rate of aging of *D. melanogaster* has been studied, using individually-housed flies. The results confirm in general outline the earlier results of Loeb and Northrop and of Alpatov and Pearl, but the numbers of animals used and the conditions of cultures were designed so as to permit a Gompertz analysis of temperature effects on aging rates. The rate of aging shows an activation energy as calculated from results at 17, 25 and 31 C. of approximately 19,000 kcal. between 17.5 and 25 C., which compares with the values of 12,700 found by Alpatov and Pearl and approximately 20,000 found by Loeb and Northrop.

Flies were exposed for a brief period (1 hour) to various temperatures beyond their optimum from 36 to 40 C. After an exposure to 38.5 C. for one hour approximately 50% of the flies, both male and female, died within 5 days. The remaining animals did not show a mortality rate significantly different from the controls kept at 25 C. These results clearly demonstrate that aging in *Drosophila* is not a result of high activation energy reactions, such as protein-denaturation. Rather, the increase in mortality at high temperatures must be a consequence of the loss of functional units through the accumulation of inhibitors and/or the exhaustion of necessary metabolites.

There are no significant differences between the behavior of male and virgin female flies as used in these experiments. The results are consistent with and clarify some of the results obtained by Smith which he interpreted to mean that the increase in mortality rate which occurs above 30 C. was a reflection of a different process than that occurring at lower temperatures.

The author wishes to express his profound gratitude to Miss M. Susanne Herman for her careful and painstaking care and assistance in these experiments.

REFERENCES

1. Alpatov, W. W., and Pearl, R.: Experimental Studies on the Duration of Life. XII. Influence of Temperature During the Larval Period and Adult Life on the Duration of Life of the Imago of *Drosophila melanogaster*. *Am. Nat., 63:* 37-67, 1929.
2. Comfort, A.: *The Biology of Senescence.* Rinehart and Co., New York, 1956.
3. Ewer, D. W., and Ewer, R. F.: The Biology and Behavior of *Pinus tectus* Boie, a Pest of Stored Products. III. The Effect of Temperature and Humidity on Oviposition, Feeding and Duration of Life Cycle. *J. Exper. Zool., 18:* 290-305, 1942.

4. Gompertz, B.: On the Nature of the Function Expressive of the Law of Human Mortality. *Philos. Trans., 115:* (Series A), 513-589, 1825.
5. Gowan, J. W.: Lengthening of Life Span in Mice in Relation to Two Deleterious Agents. In: *The Biology of Aging,* B. L. Strehler, ed. American Institute of Biological Sciences, Washington, D. C., 1960.
6. Hamperl, H.: Die Fluoreszenzmikroskopie menschlicher Gewebe. *Arch. path. Anat. 292:* 1-51, 1934.
7. Levenbook, L., and Williams, C. M.: Mitochondria in the Flight Muscles of Insects. III. Mitochondrial Cytochrome C in Relation to the Aging and Wing Beat Frequency of Flies. *J. Gen. Physiol., 39:* 497-512, 1956.
8. Loeb, J., and Northrop, J. H.: On the Influence of Food and Temperature Upon the Duration of Life. *J. Biol. Chem., 32:* 103-121, 1917.
9. MacArthur, J. W., and Bailly, W. H. T.: The Effect of Metabolic Activity on Duration of Life. I. Influence of Temperature on the Longevity of *Daphnia Magna. J. Exper. Zool., 53:* 221-242, 1929.
10. Mildvan, A. S., and Strehler, B. L.: A Critique of Theories of Mortality. In: *The Biology of Aging,* B. L. Strehler, ed. American Institute of Biological Sciences, Washington, D. C., 1960.
11. Pearl, R., and Miner, S.: The Comparative Mortality of Certain Lower Organisms. *Quart. Rev. Biol., 10:* 60-79, 1935.
12. Pearl, R., Miner, J. R., and Parker, S.: Experimental Studies on the Duration of Life. XI. Density of Population and Life Duration in *Drosophila. Am. Nat., 61:* 289-318, 1927.
13. Pearse, A. G. E.: *Histochemistry, Theoretical and Applied.* Little, Brown & Co., Boston, 1960.
14. Smith, J. Maynard: Temperature Tolerance and Acclimatization in *D. subobscura. J. Exper. Biol., 34:* 85-96, 1957.
15. Smith, J. Maynard: The Effects of Temperature and of Egg Laying on the Longevity of *D. subobscura. J. Exper. Biol., 35:* 832-842, 1958.
16. Smith, J. Maynard: Prolongation of the Life of *D. subobscura* by a Brief Exposure of Adults to a High Temperature. *Nature, 181:* 496-497, 1958.
17. Smith, J. Maynard: A Theory of Aging. *Nature, 184:* 956-957, 1959.
18. Strehler, B. L.: Origins and Comparisons of the Effects of Time and High-Energy Radiations on Living Systems. *Quart. Rev. Biol., 34:* 117-142, 1959.
19. Strehler, B. L.: *Dynamic Theories of Aging.* In: *Aging . . . Some Social and Biological Aspects,* N. W. Shock, ed. American Association for the Advancement of Science, Washington, D. C., 1960.
20. Strehler, B. L., Mark, D. D., Mildvan, A. S., and Gee, M. V.: Rate and Magnitude of Age Pigment Accumulation in the Human Myocardium. *J. Gerontol., 14:* 430-439, 1959.
21. Strehler, B. L., and Mildvan, A. S.: A General Theory of Mortality and Aging. *Science, 132:* 14-21 1960.
22. U. S. Department of Health, Education, and Welfare. Public Health Service. National Office of Vital Statistics: Death and Death Rates for 64 Selected Causes; United States, 1952. *Vit. Statist., Spec. Rep., Nat. Summaries, 40:* 57-103, 1954; *41:* 73-147, 1956.
23. Williams, C. M., Barnes, L. A., and Sawyer, W. H.: The Utilization of Glycogen by Flies During Flight and Some Aspects of the Physiological Aging of Drosophila. *Biol. Bull., Woods Hole, 84:* 263-272, 1943.

METABOLIC RATE AND AGING IN RATS DURING EXPOSURE TO COLD*

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Alterations in metabolic rate are known to affect longevity (1). The extent to which metabolic rate (oxygen consumption) was altered in male rats by 450 days of exposure to a 48 F. temperature, and some of the consequences of this alteration are discussed in this paper. Data are reported on oxygen consumption, food and water consumption, and body weight.

MATERIALS AND METHODS

This experiment was conducted in the Missouri Small Animal Climatic Laboratory. The animals consisted of 120 male rats of the Holtzman strain. They were all about 23 days of age when received, although they arrived in two shipments about 4 months apart (50 in group A and 70 in group B). Half of the group A and a half of the group B rats were placed in individual cages in a 48 F. (9 C.) temperature room. The remainder were placed in individual cages in an 83 F. (28 C.) temperature room. The relative humidity was maintained at 60 to 70% in the 48 F. room and at 50 to 55% in the 83 F. room. Care was taken to maintain the micro-climate within each cage the same as that of the room in which the cage was placed. A diffused flow of air from a duct in the ceiling passed through the wire cages, and no bedding was used. All rats were fed a Rockland rat pelleted diet. Food and water were supplied *ad libitum*.

Oxygen consumption (non-fasting, resting) was measured with an 8-chamber Regnault-Reiset volumetric type apparatus (4). The cabinet of this apparatus was connected by air ducts to an air-conditioning unit so that the oxygen measurements could be made at either 48 F. or 83 F. as desired.

For the purposes of this discussion, the distinction between the A and B groups will not be considered, as figure 1 shows that the age curves of the data for the two groups are similar. The animals kept in the 48 F. room will be called the cold rats, and those kept in the 83 F. room will be called the control rats.

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† With the technical assistance of Louise Sturm.

RESULTS

Oxygen Consumption.—After 100 days of age, the oxygen consumption of the cold rats exceeded that of the control rats by about 200 ml./hour, or 40%. Representative means and standard errors of means for the cold and control rats of Groups A, for example, were as follows: 755 ± 10 and 530 ± 14 at 260 days of age, and 804 ± 23 and 562 ± 20 at 358 days of age. For the Group B rats, representative values were 689 ± 23 and 486 ± 15 at 102 days of age, and 680 ± 17 and 481 ±12 at 186 days of age. These differences were highly significant ($P < 0.01$).

As shown in figure 1, the cold rats maintained their 40% elevation in oxygen consumption throughout the reported period. Greater increases for shorter exposures and different conditions have been reported in the literature. Herrington (3) reported increases in heat production of about 50% (based on carbon dioxide measurements). His rats, however, had lived in an environment of 23 to 25 C. (75 F.), and had been acclimated to the test temperature for only 18 hours prior to testing.

Caloric Intake.—The 40% elevation in energy expenditure of the cold rats was maintained by an elevation of approximately 65% in food consumption. At 213 days of age the Group A cold rats consumed 37.8 ± 1.5 Gm., whereas the controls consumed only 24.8 ± 0.6 Gm. Similarly, at 192 days of age, the Group B cold rats consumed 42.8 ± 1.0 Gm. and the control rats 25.7 ± 1.7 Gm. These differences were highly significant ($P < 0.01$). In grams per 100 grams body weight, the daily food consumption was about 9 for the cold rats and 5 for the controls.

Body Weight.—In spite of their greater food intake the cold rats gained weight more slowly than the controls. At 97 days of age, for example, the Group B cold rats weighed 351 ± 4.9 Gm. and the control rats weighed 407 ± 4.1 Gm. At 180 days of age their respective weights were 434 ± 5.8 Gm. and 509 ± 6.2 Gm. At 400 days of age, figure 1 shows that the Group A cold rats weighed about 100 Gm. less than

the Group A control rats. These differences were highly significant ($P < 0.01$).

Water Consumption.—The data shown in figure 1 indicate that the water consumption was higher in the cold than control rats, although not at a statistically significant level for one-day measurements. A special 5-day test of water consumption of the Group B rats, however, did show that the higher water consumption of the cold rats was highly significant ($P < 0.01$). The increased water consumption of the cold rats appeared to be due to cold diuresis. However, it may have been associated with the greater food consumption of the cold rats.

DISCUSSION

An old but intriguing theory of aging is that length of life is inversely proportional to metabolic rate. Bourlière (1) in reviewing the literature cited evidence that a) invertebrates and cold blooded vertebrates lived longer in cold environments (low metabolic rate) than in warm environments (high metabolic rates); b) small rodents lived longer if their growth and

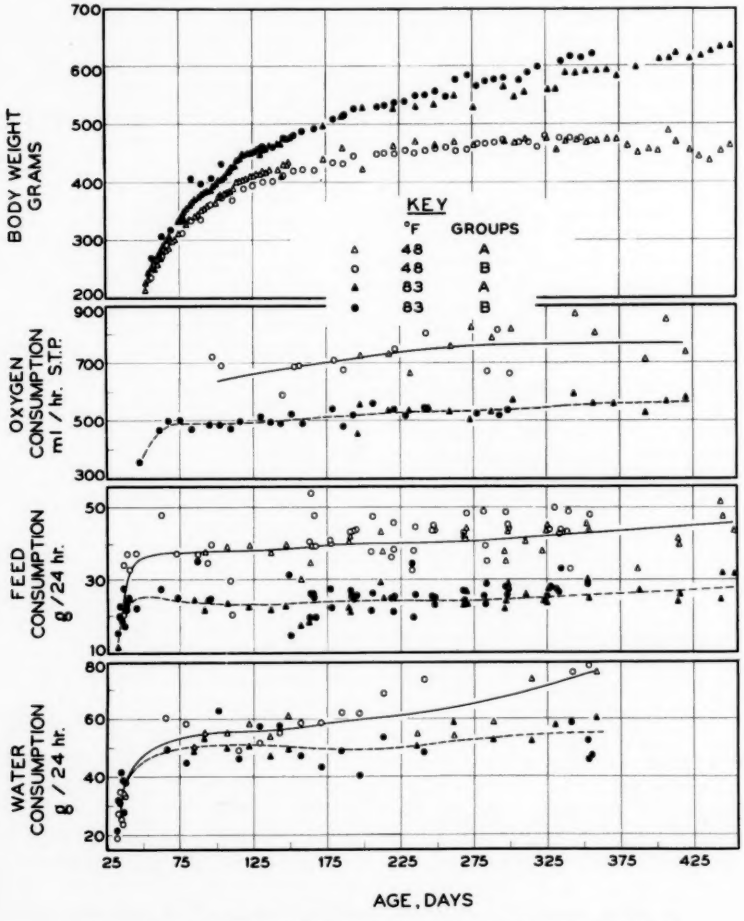

Fig. 1. The plotted points represent sample means. The number of observations within each mean varied during the experiment, but on the average the numbers of observations were as follows: oxygen consumption and feed consumption, 14 to 16; body weight and water consumption, all the living animals of a group. The trend lines were drawn by inspection to serve as guides to the eye.

TABLE 1. AGE OF DEATH OF EACH INDIVIDUAL RAT (25 RATS IN EACH GROUP).

48°F. Temperature			83°F. Temperature		
Age (Days)	Number of Deaths	Percentage Survival	Age (Days)	Number of Deaths	Percentage Survival
219	1	96			
322	1	92			
350	1	88			
359	1	84			
375	3	72			
400	2	64			
412	1	60			
434	1	56			
438	1	52			
448	1	48			
451	1	44			
472	1	40			
475	1	36			
485	1	32			
490	1	28			
496	1	24			
			508	1	96
519	1	20			
525	1	16			
550	1	12	550	1	92
			563	1	88
			568	1	84
595	1	8			
599	1	4			

metabolic rates were lowered by restriction of food; and c) hibernators lengthened their lifespan by seasonal lowering of body temperature and energy metabolism.

To suggest that a high metabolic rate causes aging implies that the metabolic processes are less than perfect (such as inadequate specificity of enzymes, accumulation of metabolic products). Sacher (5) has suggested that aging can result from irreversible changes in molecular structure caused by errors in chemical synthesis. According to this hypothesis, the number of errors would increase with increasing metabolic rate.

Further analysis of the metabolic error theory suggests that for a given metabolic rate the errors will be minimal at some optimal condition and that they will increase when conditions are less favorable. In view of the role of temperature in metabolic processes, fewest metabolic errors should occur at some fixed optimal temperature. Homeothermal regulation can be explained, in part, on this basis of reasoning.

Regulation of body temperature at an optimal level, then, should increase the lifespan of an animal unless a high metabolic rate is required to maintain this fixed temperature level. Dawson (2) cited examples of lizards that can maintain body temperature at a characteristic level of 30 C. by basking in sunshine even though the shade temperature is near freezing. By this method they approximate homeothermic regulation at a reduced metabolic cost.

The 40% increase that occurred in the oxygen consumption of the rats in the 48 F. room indicates that the white rat pays a high price to maintain an approximately normal deep body temperature in a cold environment. This 40% rise occurred even though mechanisms for conserving heat were brought into play (hair growth, peripheral cooling, curling into a ball to reduce exposed surface). Because of the rats' relatively large ratio of surface area to body weight (4 to 5 times that of man), any reduction in area or temperature of this heat dissipating surface is quite important in a cold environment.

The ages of death among the older Group A rats are shown in table 1. This table is extended to include older ages than those reported in figure 1, but it is still incomplete since one of the cold rats and 21 of the control rats are still alive. Deaths among the younger Group B rats are too few to evaluate.

Postmortem examinations of the rats from the 48 F. room revealed thickening of arteries, degeneration of kidneys and other organs, thromboses, tumors, mild ear infections, and pneu-

monia. The one death among the controls was due to an inner ear infection. Cold injury to the tails of the cold rats suggests that below optimal temperatures existed in these remote appendages, resulting in increased metabolic errors (tissue damage). The absence of body fat in the cold rats was in marked contrast to the ample body fat in the controls. Lowered reserve as well as lowered resistence may have been an important factor in many deaths. The shortened lifespan of the cold rats is in accord with the hypothesis that a high metabolic rate accelerates aging. However, additional studies are necessary to differentiate between stress, aging, and other effects.

The results of this experiment suggest that lifespan will not be increased by slowing down the growth rate if the metabolic rate is high (the metabolic rate could be lowered by restriction of food in a comfortable environment). When the metabolic rate of male rats was increased by cold exposure, their lifespan was shortened even though their rate of gain in body weight was decreased.

SUMMARY

Comparisons of male rats which were exposed continuously to a temperature of 48 F. with controls which lived at 83 F. showed that the cold-exposed group drank significantly more water, increased their oxygen consumption by 40%, and consumed 65% more food, but gained weight more slowly. The lifespan of the cold-exposed rats was not increased by their low growth rates. Deaths among the cold-exposed and control rats were in accord with the hypothesis that a high metabolic rate accelerates aging.

REFERENCES

1. Bourlière, F.: The Comparative Biology of Aging. *J. Gerontol., 13:* 16-24, 1958.
2. Dawson, W. R.: Physiological Responses to Temperature in the Lizard *Euneces Obsoletus. Physiol. Zool.,* 33: 87-103, 1960.
3. Herrington, L. P.: The Heat Regulation of Small Laboratory Animals at Various Environmental Temperatures. *Am. J. Physiol., 129:* 123-139, 1940.
4. Kibler, H. H., and Brody, S.: Metabolism and Growth Rate of Rats. *J. Nutrition, 24:* 461-468, 1942.
5. Sacher, G. A.: Relation of Lifespan to Brain Weight and Body Weight in Mammals. In: Ciba Foundation Colloquia On Ageing. 5: *The Lifespan of Animals,* C. E. W. Wolstenholme and Maeve O'Connor, eds. Little, Brown and Company, Boston, 1959, pp. 115-133.

HEXOSAMINE AND HYDROXYPROLINE CONCENTRATIONS IN SKIN AND BUCCAL MUCOSA OF AN AGING RAT POPULATION*

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It is readily observed that physiological aging does not necessarily coincide with chronological aging. Cowdry (2) postulated that an increase in the fibers of the connective tissue surrounding the capillary bed might obstruct the flow of fluids through these tissues and thus be involved in aging through reduction of nutrition. Sobel and associates (7, 8), following this general thesis, demonstrated a relation between collagen and ground substance, the hexosamine to collagen ratio, which diminished with age as measured by increase in weight. This was a consequence of a more rapid increase in collagen than in hexosamine, which also increased.

Houck and Jacob (3) were not able to observe a significant change in the concentration of hexosamine of connective tissue of whole rat skin with increased weight, but hydroxyproline did increase during early growth, then decreased. This in turn was reflected as a decrease in the hexosamine to hydroxyproline ratio during early growth followed by an increase.

The studies of Houck and Jacob and Sobel and associates indicate that during growth the ratio of hexosamine to collagen decreases, hydroxyproline increases, and any hexosamine change is questionable. We have studied the hexosamine and hydroxyproline concentrations of the three related tissue areas (ventral thoracic skin, palmar foot skin, and buccal mucosa) in female rats and related these concentrations to chronological age beyond the growth period as measured by body weight change.

MATERIALS AND METHODS

For this study, a colony of rats of the Sprague-Dawley strain was maintained in air-conditioned quarters on a diet of Purina Laboratory Chow *ad libitum*. At irregular intervals female rats of various ages were sacrificed until tissues from 34 animals had been analyzed. These animals ranged in age from 12 to 975 days and were divided into 5 groups: 6 animals under 100 days, 6 animals 101 to 300 days, 7 animals 301 to 500 days, 7 animals 501 to 700 days, and 8 animals over 701 days. The tissue samples from each rat consisted of about 75 mg. of buccal mucosa, 100 mg. of shaved ventral thoracic skin, and 75 mg. of palmar foot skin. Since the proportion of moisture and fat varies considerably, the tissues were oven dried at 100 C. for 24 hours, after which the fat was extracted with 2 washings of 25 ml. ether for 6 hours each. The tissues were returned to the oven for 12 hours to eliminate any ether or absorbed moisture. The tissues were weighed and transferred to glass-stoppered centrifuge tubes in which they were hydrolyzed in 2 ml. of 2 N HCl at 100 C. for 15 hours. Hydroxyproline was determined after the method of Martin and Axelrod (4) as modified by Neuman and Logan (5). Hexosamine was determined by the method of Blix (1). A Beckman DU spectrophotometer was used for the optical density measurements.

RESULTS

The growth pattern of this strain of rats was such that they grew rapidly for the first 175-200 days to a weight of about 275 Gm. Growth continued for the next 175-200 days at a decreased rate, at which time the rats had reached their maximum weight of 300-325 Gm. The mean ages of the 5 groups of rats were 50, 195, 425, 650, and 800 days.

The concentrations of hydroxyproline and hexosamine as percentages of the dry-defatted tissues with standard deviations are shown in table 1 for palmar skin of the foot, ventral thoracic skin, and buccal mucosa. The ratios of hexosamine to hydroxyproline are also shown. The change in hexosamine with age is not statisically significant in any of the 3 tissue areas. The amount of hydroxyproline increased significantly between the two youngest groups, while the older groups did not show a significant change in hydroxyproline content.

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† U.S. Public Health Service Post-Sophomore Dental Research Fellow.

TABLE 1. CHANGES IN HEXOSAMINE AND HYDROXYPROLINE CONCENTRATIONS IN SKIN AND BUCCAL MUCOSA OF RATS WITH AGE CHANGE.

Animals	No.	Palmar Foot Skin					Ventral Thoracic Skin					Buccal Mucosa				
Age Range (Days)		Hexosamine as % of Dried-defatted Tissue	S. D.	Hydroxyproline as % of Dried-defatted Tissue	S. D.	Ratio of Hexosamine to Hydroxyproline	Hexosamine as % of Dried-defatted Tissue	S. D.	Hydroxyproline as % of Dried-defatted Tissue	S. D.	Ratio of Hexosamine to Hydroxyproline	Hexosamine as % of Dried-defatted Tissue	S. D.	Hydroxyproline as % of Dried-defatted Tissue	S. D.	Ratio of Hexosamine to Hydroxyproline
Under 100	6	0.381	±0.043	2.78	±1.10	0.140	0.499	±0.069	2.79	±1.10	0.180	0.487	±0.025	2.01	±0.90	0.242
101-300	6	0.472	±0.082	5.21	±0.79	0.090	0.484	±0.096	6.22	±0.60	0.078	0.592	±0.073	4.25	±0.71	0.140
301-500	7	0.533	±0.100	4.53	±1.42	0.118	0.494	±0.078	6.22	±2.00	0.079	0.601	±0.163	3.27	±0.82	0.184
501-700	7	0.469	±0.017	4.47	±0.81	0.105	0.476	±0.118	6.15	±1.70	0.077	0.506	±0.036	3.61	±0.51	0.140
Over 701	8	0.412	±0.025	4.06	±0.96	0.101	0.531	±0.044	5.42	±1.00	0.098	0.525	±0.047	4.0[illegible]	±0.91	0.130

The hexosamine to hydroxyproline ratio decreased significantly in all three tissue areas between the two youngest age groups, but remained unchanged in the ventral thoracic skin of the older groups. In palmar foot skin and buccal mucosa the hexosamine to hydroxyproline ratio was somewhat higher in the animals of the 301- to 500-day group, but the change was not significant considering the standard deviations of hexosamine and hydroxyproline of these groups.

When the concentration of hydroxyproline was related to weight during the period of active growth, there was a high degree of correlation between weight and hydroxyproline concentration as shown in figure 1.

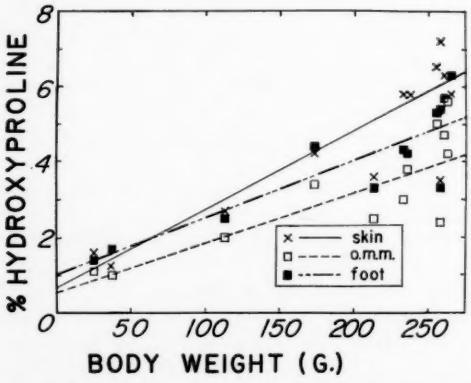

Fig. 1. Effect of body weight upon the concentration of hydroxyproline in palmar foot skin (■), ventral thoracic skin (X), and buccal mucosa (O.M.M.) (□) during active growth.

DISCUSSION

In agreement with Sobel and associates (7, 8) and Houck and Jacob (3), we found that hydroxyproline concentration increased with age during the period of most active growth to about 250 Gm. in body weight. In animals beyond the period of active growth, we found as much variation between individuals of the same age as between individuals of different ages. Since the values of hydroxyproline are high in relation to the relatively unchanged amount of hexosamine, the hexosamine to hydroxyproline ratio is affected by the hydroxyproline almost to the point of being a reciprocal function of the hydroxyproline content. This being the case, it would be possible to relate hydroxyproline to any other constituent of the body that is unchanged with age and note a change somewhat similar to the ratio studied here. In a preliminary report on this work Ring (6) reported what seemed to be a slight increase in the hexosamine, especially of foot skin, occurring in the middle of the age range (500-600 days). These data were based on individual measurements, and the apparent change does not occur when the group method of presenting the data is employed.

Sobel (7) postulated that the more rapid increase in collagen content with the resultant decrease in hexosamine to collagen ratio might ultimately accelerate the aging phenomenon. If an increase in collagen, as measured by hydroxyproline in relation to hexosamine, is functionally related to the acceleration of the aging process during growth, it would seem that, after

active growth has ceased, a continued increase in collagen is not necessary to keep the aging process going.

This might lead one to question the hexosamine to hydroxyproline (or hexosamine to collagen) ratio as an adequate index of aging or as an expression of a causative factor in the aging process. Since nutrients and waste products must diffuse through the ground substance, perhaps the degree of polymerization of the ground substance of connective tissue should also be studied as a change possibly related to the aging phenomenon.

SUMMARY

In a group of 34 white rats ranging in age from 12 to 975 days, the concentration of hexosamine in dried-defatted connective tissue of skin and buccal mucosa did not change significantly with increased age, whereas concentrations of hydroxyproline in these tissues did increase significantly during growth but remained unchanged during adulthood and senescence. The ratio of hexosamine to hydroxyproline followed a pattern that is roughly reciprocal to the hydroxyproline concentration.

REFERENCES

1. Blix, G.: The Determination of Hexosamine According to Elson and Morgan. *Acta chem. scandinav., 2:* 467-473, 1948.
2. Cowdry, E. V.: Ageing of Tissue Fluids. In: *Cowdry's Problems of Ageing.* Lansing, A. I., ed., Williams & Wilkins Co., Baltimore, 1952.
3. Houck, J. C., and Jacob, R. A.: Effect of Age upon Collagen and Hexosamine Content of Rat Skin. *Proc. Soc. Exper. Biol. & Med., 97:* 604-606, 1958.
4. Martin, C. J., and Axelrod, A. E.: A Modified Method for Determination of Hydroxyproline. *Proc. Soc. Exper. Biol. & Med., 83:* 461-462, 1953.
5. Neuman, R. E., and Logan, M. A.: The Determination of Collagen and Elastin in Tissues. *J. Biol. Chem., 186:* 549-556, 1950.
6. Ring, J. R.: Histological and Histochemical Age Changes in Oral Subepithelial Connective Tissue. In: *Aging . . . Some Social and Biological Aspects,* N. W. Shock, ed. American Association for the Advancement of Science, Washington, D. C., 1960.
7. Sobel, H., and Marmorston, J.: The Possible Role of the Gel-Fiber Ratio of Connective Tissue in the Aging Process. *J. Gerontol., 11:* 2-7, 1956.
8. Sobel, H., Zutrauen, H. A. and Marmorston, J.: The Collagen and Hexosamine Content of the Skin of Normal and Experimentally Treated Rats. *Arch. Biochem. & Biophys., 46:* 221-231, 1953.

EFFECT OF 17-ETHYL-19-NORTESTOSTERONE ON ARTICULAR AGING AND OSTEOARTHROSIS IN ORCHIECTOMIZED MICE*

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A positive correlation could be established between the progress of articular aging and the evolution of osteoarthrosis in man and animals (1, 2, 4, 5, 7, 8, 9, 12). These processes were accelerated and intensified by growth-promoting factors while they were retarded and attenuated in mice orchiectomized early in life (9, 10). Whether or not and to what extent these effects are responses to specific stimuli or whether they represent a reaction to general metabolic imbalances is unknown. In an attempt to obtain additional information regarding this question, it was decided to test the articular effects of prolonged administration of 17-ethyl-19-nortestosterone,† a steroid that stimulates protein anabolism (3, 6) and promotes epiphyseal growth and development (10).

MATERIALS AND METHODS

Twenty-nine male mice of the closely inbred strain C57BL Jax6 raised in our laboratory and kept on a diet of Purina laboratory chow and water *ad libitum* were orchiectomized at the age of one month. Starting a few days postoperatively, the animals received subcutaneous injections of nortestosterone 6 times weekly for 12 to 15 months. Fifteen mg. of the substance was dissolved in 25 cc. sesame oil, and at first 0.05 cc. of this solution were injected; after 6 to 8 weeks, when the mice had doubled their weight, the dose was doubled, so that the daily dose given was about 0.2 mg./Kg./body weight; this is considered a low dose (3, 6).

During the early stages of the experiment the treatment was tolerated without ill effects. However, toward the end of the first year the injections were made with increasing difficulty due to subcutaneous scarring and cyst formation. Therefore, the treatment of the majority of animals was discontinued after one year. From the age of 16 months on, a number of mice, particularly those which had developed oil cysts, died or were in such poor condition that they had to be sacrificed. The experiment was terminated when the mice were 18 months old. At this age articular aging and osteoarthrosis are well under way in untreated mice of this strain (7, 9).

At necropsy the knee joints were removed, fixed and decalcified in Bouin's solution, and embedded in paraffin. Semiserial sections were stained with hematoxylin and eosin. The findings in the epiphyseal growth zones and in the joints were compared with those obtained previously in untreated mice and in untreated castrates of corresponding age (9). The results were tabulated and their statistical significance was determined by means of the Chi square method. The present report deals with observations made in: 1) untreated controls, 34 mice; 2) castrate controls, 29 mice; 3) castrates receiving nortestosterone, 29 mice.

RESULTS

Weights.—At the age of 6 months, the mean weight of untreated controls was 26.3 Gm., that of untreated castrates was 22.0 Gm., and that of castrates receiving nortestosterone was 25.7 Gm. Therefore, the treated castrates had gained almost as much weight as the untreated controls (10). At the age of 18 months, the mean weight of treated castrates that were in good physical condition was 28 Gm., that of untreated controls and that of untreated castrates 32 and 24 Gm., respectively (table 1). While from the age of 6 to 18 months the untreated controls had on the average added about 6 Gm. of weight, both untreated and treated castrates had gained only about 2 Gm. during the same period. Apparently, therefore, the effectiveness of the steroid declined after the end of the first 5 months of treatment or had ceased altogether.

Microscopic Findings. A. Growth Zones.—In 18 month-old untreated mice of strain C57BL Jax6, the growth zones at the upper end of the tibia are usually represented by a narrow layer

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TABLE 1. ARTICULAR FINDINGS IN UNTREATED AND CASTRATE CONTROLS AND IN CASTRATES RECEIVING NORTESTOSTERONE.

Series	No. of Mice	Mean Age at Death* (Months)	Mean Weights (Gm. at 18 Months)	Articular Findings: No Change No.	%	Age Changes No.	%	Osteoarthrosis No.	%
Non-Castrated controls	34	16.8	32 max. dev. 3 min. dev. 3	4	12	19	56	11	32
Castrated controls	29	16.5	24 max. dev. 5 min. dev. 3	12	41	16	56	1	3*
Castrates treated with nortestosterone	29	16.9	28 max. dev. 7 min. dev. 5	3	10	15	52	11	38*

* $P < .01$.
* Including both animals that died spontaneously and those sacrificed according to schedule.

of inactive heavily calcified cartilage undergoing partial or complete ossification and showing perforations of varying width. These changes vary in degree and overlap to a large extent (7). In castrate controls of this age, degeneration and breakdown of the cartilage were markedly delayed. Cartilage cell columns containing 4 to 6 cells of proliferating type persisted, large plugs of degenerated cartilage were rare, ossification was decreased, and perforations were as a rule missing. The growth zones were thus in a youthful state and resembled conditions seen in untreated controls 6 to 9 months old. In 18 of 27 castrates treated with the steroid and 18 months old, the structure of the epiphyses was about as expected in untreated animals of this age. However, the appearance of the growth zones after treatment with nortestosterone differed from that of untreated controls in that hyalinization and ossification were more irregular and patchier in distribution than in the latter. In some areas the hyalinized areas were set off sharply from the calcifying cartilage and in others the zone of calcification was narrower than ordinarily. Nine of the injected castrates showed comparatively youthful growth zones with short columns of inactive cartilage and occasional small perforations, findings similar to those seen in untreated controls at the age of about 12 months.

B. *Joints.*—According to criteria established elsewhere in detail (9), hyperplasia, hypertrophy, and degeneration of cartilage with intact articular surface were classified as age changes. Erosions of the surface with overgrowth of cartilage or marginal lipping, analogous to findings in the human disease, were designated as osteoarthrosis. Slight lesions are characterized by small surface defects, advanced lesions by deep penetrating ulcers with marginal outgrowths and involvement of the soft tissues. The photomicrographs represented by figures 1-4 show: 1) unchanged articular surface, 2) articular age changes, 3) slight, and 4) advanced osteoarthrosis.

The articular findings are presented in table 1. Each animal is listed only once, although lesions interpreted as aging changes are regularly present in animals affected with osteoarthrosis. Under the latter conditions, animals are classified as having osteoarthrosis. Untreated controls had a mean age of 16.8 months; the joints of 4 mice (12%) were unaltered, 19 mice (56%) showed articular age changes, and 11 (32%) had osteoarthrosis of more or less advanced degree. Non-injected castrates had a mean age of 16.5 months; the joints of 12 mice (41%) were unaltered, those of 16 mice (56%) showed age changes, and one mouse (3%) had slight osteoarthrosis. Castration thus caused a significant decrease of the incidence of osteoarthrosis as compared to that found in untreated controls ($P < .01$). The castrates that had received nortestosterone had a mean age of 16.9 months; the joints of 3 mice (10%) were unchanged, those of 15 mice (52%) showed age changes, and those of 11 mice (38%) had osteoarthrosis. Thus as compared to non-injected castrates the steroid significantly increased the incidence of joint disease ($P < .01$). However, there was a striking difference in the severity of the articular lesions seen in untreated controls and steroid-treated castrates, respectively. Of the 11 test mice affected 6 had very minor focal lesions; in 5 animals articular involvement was more widespread but still slight. There were no severe lesions; the most advanced one is illustrated in figure 3. Thus, while nortestosterone increased the incidence of osteoarthrosis to a level similar to that found in untreated controls, the severity of the lesions differed little from that seen in untreated castrates.

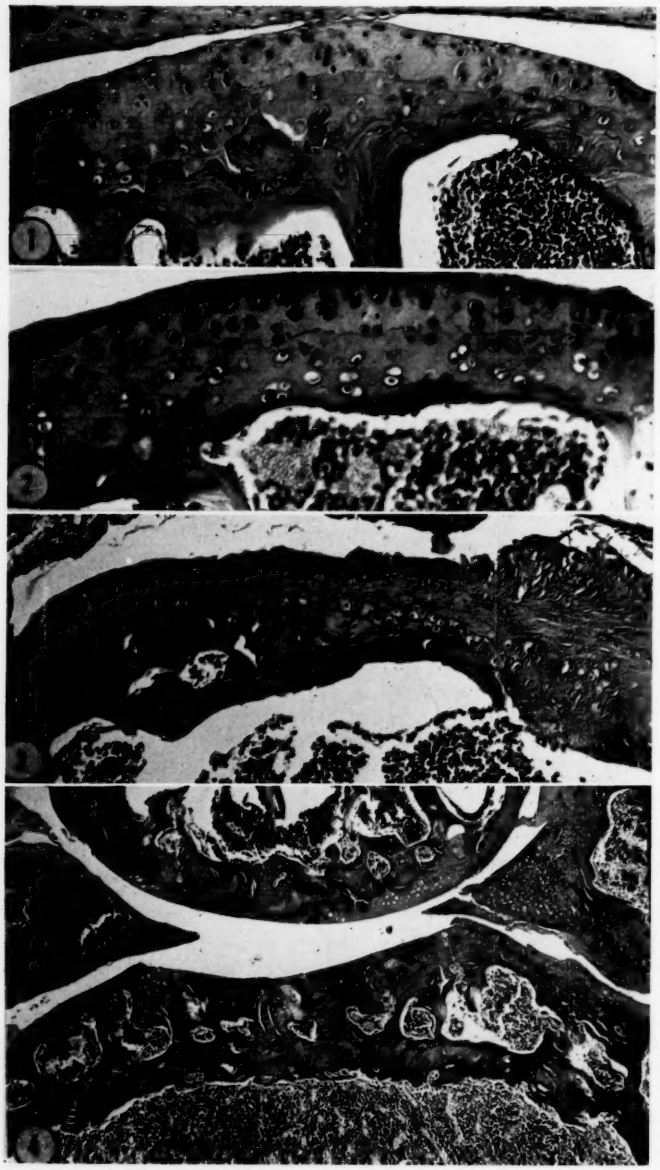

Fig. 1. Unchanged joint: Tibial surface smooth; cartliage cells showing the usual regular arrangement in small columns.

Fig. 2. Aging changes: Tibial surface intact; diffuse hyperplasia and hypertrophy of cartilage cells with basophilic halos indicative of growth; some cells with pycnotic nuclei undergoing regressive change.

Fig. 3. Osteoarthrosis slight: Fraying and shallow ulceration of tibial surface; cartilage remnants at both margins of the ulcer.

Fig. 4. Osteoarthrosis advanced: Tibia at bottom, femur at top, menisci at both sides of picture. Deep ulcer of tibia with cartilage at margins and eburnation of the floor of the ulcer; loss of cartilage of femoral surface with baring and thickening of underlying bone.

DISCUSSION

In mice of strain C57BL Jax6, orchiectomy performed at the age of one month delayed skeletal aging and decreased the incidence of osteoarthrosis as compared with conditions seen in untreated controls. After prolonged postcastrational administration of low doses of nortestosterone, development and aging of epiphyseal discs and joints proceeded in a more normal fashion; however, epiphyseo-diaphyseal union remained retarded. Concurrently the incidence of osteoarthrosis was increased to the level found in untreated controls; but the joint lesions were less severe than ordinarily. The steroid thus did not completely reverse the effect of castration. This might have been due to

waning action of the drug with prolonged administration. This possibility was also suggested by the lag of increase in body weights, as the injected animals grew older, and by similar results obtained by previous investigators (3, 6). On the other hand, the findings may indicate that the skeletal effects of the steroid are not identical with those of testosterone and that nortestosterone, at least under the conditions of the present experiment, compensated only partly for the deficiency of male sex hormone. Whether or not qualitative differences exist in the articular effects of nortestosterone and testosterone, respectively, is an important question because of its bearing on the mechanism of the skeletal action of testosterone. If there were qualitative differences, the skeletal effects of the male sex hormone would not be solely due to its protein-anabolic properties, which it shares with nortestosterone.

The effect of nortestosterone resembled that of other growth stimuli in that it promoted at least in castrate mice, not only growth of cartilage but also the evolution of degenerative joint disease. These observations demonstrate again the striking similarity in the response of ephiphyseal and articular cartilages to exogenous stimuli. This is not surprising in view of the common origin of the two cartilages, and it may be surmised that their reaction to endogenous stimuli, e.g., to those that promote aging, would also be similar. Since it has been shown repeatedly that aging of the epiphyseal growth zones and of the joints run a comparable course (7), the tendency of the articular cartilage to age may be estimated by observation of the growth zones. However, this does not imply that the incidence of osteoarthrosis can be predicted by the progress of epiphyseal development. No such correlation could be established in mice of strains which vary in the incidence of spontaneous osteoarthrosis (11). Moreover, under experimental conditions, osteoarthrosis and epiphyseo-diaphyseal union, the latter of which depends on progressive resorption of the epiphyseal discs, often fail to go hand in hand (7). Senile osteoarthrosis results from a multiplicity of factors of which articular aging is only one. Articular aging is an important predisposing factor inasmuch as it makes the senescent cartilage vulnerable to influences which precipitate the joint disease. The precipitating factors involve the articular tissue, but not in the growth zones, and may be altogether unrelated to aging processes. Consequently osteoarthrosis takes its course partly independent of aging processes.

SUMMARY

Orchiectomy performed in growing mice (29 male animals of strain C57BL Jax6) retarded skeletal aging, decreased the incidence and attenuated the severity of osteoarthrosis as compared to conditions in 34 non-castrated controls. Prolonged administration of low doses of the protein-anabolic steroid 17-ethyl-19-nortestosterone to 29 orchiectomized animals partly reversed the skeletal effects of castration. Development and aging of epiphyseal and articular cartilage proceeded in a more normal fashion in the steroid-treated castrates and the incidence of osteoarthrosis about equalled that seen in 34 non-castrated controls; however, in the nortestosterone-treated castrates the joint lesions were distinctly less severe than in the non-castrated mice. The failure of nortestosterone to substitute completely for the loss of testicular activity is probably caused by waning effectiveness of the steroid with prolonged administration. It may be concluded that in untreated male mice the articular effects of testosterone are at least partly due to its protein-anabolic properties.

REFERENCES

1. Bennett, G. A., Waine, H., and Bauer, W.: *Changes in the Knee Joint at Various Ages; with Particular Reference to the Nature of Degenerative Joint Disease.* The Commonwealth Fund, New York, 1942.
2. DePalma, A. F.: *Degenerative Changes in the Sternoclavicular and Acromioclavicular Joint in Various Decades.* Am. Lect. Series, Publication No. 309, Charles C Thomas, Springfield, Ill., 1957.
3. Gorham, G. S., Eisenberg, E., Moon, H. D., and Sakomoto, W.: Methylandrostenediol: A Protein-Anabolic Steroid with Little Androgenic Activity. *J. Clin. Endocrinol., 11*:209-212, 1951.
4. Heine, J.: Über die Arthritis deformans. *Arch. path. Anat.*, 260:521-663, 1926.
5. Payr, E.: *Gelenksteifen und Gelenkplastik, Part I.* J. Springer, Berlin, 1934.
6. Saunders, F., and Drill, V. A.: Comparative Androgenic and Anabolic Effects of Several Steroids. *Proc. Soc. Exper. Biol. & Med., 94*:646-649, 1957.
7. Silberberg, M., and Silberberg, R.: The Effects of Endocrine Secretions in Articular Tissues and Their Relation to Ageing Processes. In: *Rheumatic Diseases,* C. H. Slocumb, ed., W. B. Saunders Co., Philadelphia, London, 1952.

8. Silberberg, M., Frank, E. L., Jarrett, S. R., and Silberberg, R.: Ageing and Osteoarthritis of the Human Sternoclavicular Joint. *Am. J. Pathol.*, 35: 851-865, 1959.

9. Silberberg, R., Thomasson, R., and Silberberg, M.: Degenerative Joint Disease in Castrate Mice. II. Effect of Orchiectomy at Various Ages. *Arch. Pathol.*, 65:442-444, 1958.

10. Silberberg, R., and Silberberg, M.: Epiphyseal Growth and Development in Mice Following Administration of a Protein-Anabolic Steroid (17-Ethyl-19-Nortestosterone). *Anat. Rec.* 1961 (in press).

11. Sokoloff, L., Jay, Jr., G.E., and Randolph, L. K.: Variations in Epiphyseal Maturation of Medial Epicondyle of Humerus in Inbred Strains of Mice. *Proc. Soc. Exp. Biol. & Med.*, *103*:491-494, 1960.

12. Weichselbaum, A.: Die senilen Veränderungen der Gelenke und deren Zusammenhang mit der Arthritis deformans. *Sitzungsber. d Kaiserl. Akad. d. Wissensch.*, *75:* 193-243, 1877.

THE ACONITASE ACTIVITY OF ARTERIAL TISSUE IN INDIVIDUALS OF VARIOUS AGES*

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The presence in human aortic tissue of a notable activity of aconitase was reported in a previous publication from this laboratory (2). Since aconitase catalyzes the interconversion between citrate and cis-aconitate, this enzyme constitutes an essential link in the chain of enzymes of the tricarboxylic acid cycle. Later investigations (1, 3, 6) from this department on other enzymes of this cycle have, in general, revealed significantly higher tissue activities than those recorded for aconitase, and thus it was considered advisable to extend the previous studies on human aortic tissue to include 1) separate aconitase determinations on normal and arteriosclerotic tissue portions, 2) measurements on a large number of tissue samples to permit evaluation of the relation between age and aconitase activity, and 3) assays of the activity of aconitase in samples of pulmonary artery tissue, because this blood vessel rarely is the site of serious arteriosclerotic changes. The results of these investigations will be reported in the present publication.

MATERIALS AND METHODS

One hundred and fifteen samples of the descending thoracic aorta and 68 samples of the pulmonary artery were included in the study. The samples were obtained fresh at autopsy at the St. Louis City Morgue from individuals ranging in age between 3 weeks and 87 years. Immediately after removal of the arterial specimens from the bodies the samples were placed in containers immersed in crushed ice. Since it had been shown in the previous study (2) that the aconitase activity of the arterial tissue tends to decrease appreciably after 24 hours' storage at 4 C., the enzyme assays were conducted within 3 hours after acquisition of the samples. After removal of the adventitia, the arterial tissue was rinsed briefly with isotonic sodium chloride solution; the intima-media layers of the samples were subsequently homogenized in a Kontes homogenizer with 9 volumes of 0.1 M phosphate buffer, pH 7.4, making 10% homogenates.

The determination of the aconitase activity was carried out essentially as described in the previous publication (2) by measurement of the quantity of citric acid formed through incubation of the tissue with cis-aconitate. The final millimolar concentrations used during the incubation (total volume, 12.0 ml.) were: cis-aconitate, 33.3: phosphate buffer, pH 7.4, 66.6. Two separate flasks were used for each tissue sample, one for measurement of the citric acid content at zero time, and the other for determination of the quantity of citric acid formed following 30 minutes' incubation of the homogenate with the substrate-buffer solution. Four ml. of 0.1 M phosphate buffer, pH 7.4, and 4.0 ml. of 0.1 M cis-aconitic acid solution, adjusted with sodium hydroxide to pH 7.4, were pipetted into each container, after which the flasks were preheated for 15 minutes at 38 C. in an Eberbach shaking water bath. To the flask used for the determination of the zero time citric acid value, 20.0 ml. of 20% trichloroacetic acid were then added, followed by 4.0 ml. of 10% tissue homogenate (corresponding to 400 mg. of fresh tissue). After addition of a similar quantity of tissue homogenate to the other flask, both samples were incubated and shaken in the water bath for exactly 30 minutes. At the end of this period, the enzyme activity of the test sample was stopped by addition of 20.0 ml. of 20% trichloroacetic acid. The samples were subsequently filtered through Whatman No. 4 filter paper and the filtrates collected in 250 ml. Erlenmeyer flasks. The incubation flasks were rinsed with successive small portions of distilled water, and the rinse water was likewise passed through the filter papers. A reagent blank was run with each set of tissue assays.

The determination of citric acid was carried out on each filtrate essentially as described by Pucher, Sherman, and Vickery (5), using ferrous sulfate as decolorizing agent. The removal of iron during the subsequent stages of the pentabromoacetone extraction was ascertained through the use of the α, α'-dipyridyl test.

The sodium sulfide-pyridine medium containing the extracted pentabromoacetone was made up to 10.0 ml. volume in a measuring cylinder, and the o.d. of the test sample was read against a sodium sulfide-pyridine blank solution at 450 millimicrons, using a Beckman DU spectrophotometer and a cell with a 10 mm. light path. In accordance with the observations by Natelson, Logovyi, and Pincus (4) the highest absorbance was recorded at 450 millimicrons, for which reason this wavelength was chosen for the colorimetric determination of the samples. In the case of samples exhibiting color of high intensity, a Beckman #10536 silica spacer was inserted in the cell to obtain a light path of only 1.0 mm. The average increase in o.d. noted for the reagent blank following 30 minutes' incubation was 0.008.

A citric acid standard curve was constructed (fig. 1) by treating samples containing citric acid in quantities ranging from 0.02 to 1.20 mg. in a similar manner as that used for the trichloroacetic acid tissue sample filtrates. The average difference between duplicate de-

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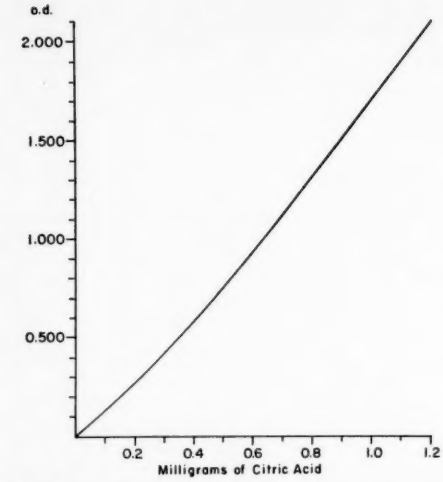

Fig. 1. Citric acid standard curve. The readings were made at 450 millimicrons (10 mm. ligth path, 10.0 ml. volume) against a sodium sulfide-pyridine blank solution.

terminations, carried out as blind tests, was 2.5%. The purity of the commercial citric acid preparation used for construction of the standard curve was established by titration.

The correlation between time of incubation and quantity of citric acid formed has been reported in the previous publication (2), which also lists the relation between quantities of tissue used and recorded enzyme activities. A determination of K_m under the present experimental conditions revealed a value of 4.78×10^{-3} M.

RESULTS

The mean aconitase activities of aortic and pulmonary artery samples observed for various age groups have been listed in table 1.

Aortic Samples

1. *Normal aortic tissue.* — The individual aconitase activity values recorded for the normal aortic tissue samples have been plotted in figure 2. It will be seen from the figure and from the data listed in table 1 that the average aconitase activity observed for samples from children (0.027 millimoles of cis-aconitate metabolized/Gm. wet tissue/hour) was somewhat higher than the mean value found for samples from adults (0.019 millimoles cis-aconitate metabolized/Gm. wet tissue/hour). The corresponding values expressed on the basis of tissue nitrogen content were 0.766 and 0.535. For the 104 aortic samples from subjects above the age of 20 years no significant variation in aconitase activity with age was observed, the coefficient of correlation between age and enzyme activity being -0.04 ($t = 0.41$) when calculated on the basis of wet tissue weight and $+0.11$ ($t = 1.12$) when expressed on the basis of tissue nitrogen content.

2. *Arteriosclerotic aortic tissue.*—The results of comparisons between the aconitase activities of arteriosclerotic and normal tissue portions of the same blood vessels are listed in table 2. It will be seen from the table that the mean enzyme activity of the arteriosclerotic tissue for the 50-59 and 60-87-year groups and for the total number of samples was moderately, but significantly, lower than the activity of the normal tissue when calculated on the basis of wet tissue weight, but that a smaller difference was recorded when the activity values were expressed on the basis of the tissue nitrogen content.

TABLE 1. MEAN ACONITASE ACTIVITIES OF HUMAN ARTERIAL TISSUE IN VARIOUS AGE GROUPS.

Age Group (Years)	N	Cholesterol, % of Wet Weight	mM Cis-Aconitate Metab./Gm. Wet Tissue/Hour	s.d. of distr.	mM Cis-Aconitate Metab./Gm. Tissue N/Hour	s.d. of distr.
Normal Aortic Tissue						
0- 9	7	0.2	0.0281	0.0092	0.840	0.386
10-19	4	0.3	0.0246	——	0.650	——
20-29	10	0.4	0.0184	0.0054	0.461	0.155
30-39	14	0.5	0.0206	0.0050	0.516	0.124
40-49	21	0.5	0.0190	0.0072	0.540	0.211
50-59	29	0.6	0.0188	0.0060	0.538	0.222
60-69	24	0.6	0.0196	0.0071	0.567	0.196
70-87	6	0.8	0.0193	0.0099	0.570	0.308
Grand Mean			0.0200	0.0072	0.559	0.200
Arteriosclerotic Aortic Tissue						
10-19	1	0.5	0.0282	——	0.485	——
20-29	2	1.3	0.0167	——	0.370	——
30-39	4	1.2	0.0244	——	0.685	——
40-49	11	1.7	0.0150	0.0043	0.442	0.150
50-59	20	2.1	0.0178	0.0067	0.542	0.204
60-69	15	2.0	0.0151	0.0054	0.472	0.140
70-87	4	3.1	0.0176	——	0.574	——
Grand Mean			0.0172	0.0069	0.510	0.209
Pulmonary Artery Tissue						
10-19	2	0.2	0.0345	——	0.906	——
20-29	5	0.2	0.0265	0.0123	0.685	0.327
30-39	9	0.3	0.0301	0.0085	0.905	0.344
40-49	12	0.3	0.0229	0.0049	0.750	0.222
50-59	16	0.3	0.0255	0.0086	0.745	0.286
60-69	20	0.4	0.0243	0.0067	0.716	0.191
70-87	4	0.4	0.0262	——	0.795	——
Grand Mean			0.0257	0.0077	0.762	0.234

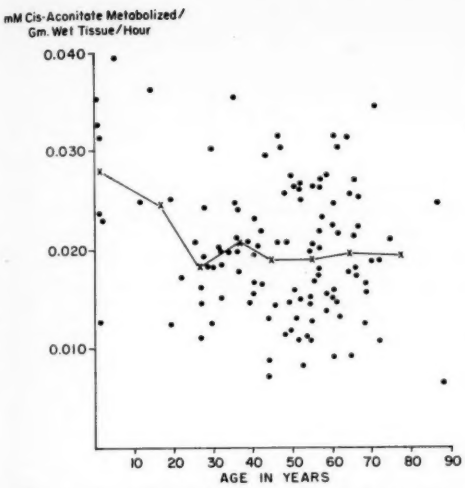

Fig. 2. Aconitase activity of normal aortic tissue samples.

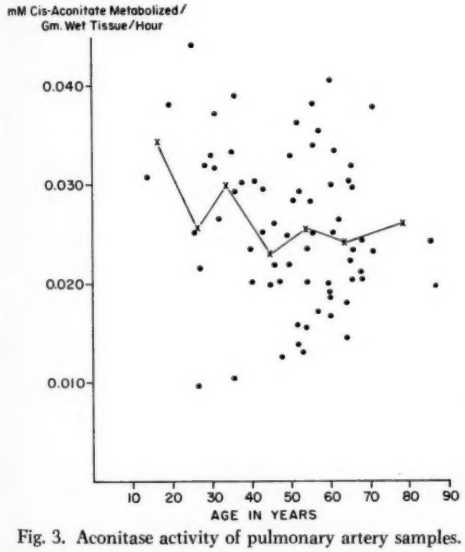

Fig. 3. Aconitase activity of pulmonary artery samples.

TABLE 2. ACTIVITY OF ARTERIOSCLEROTIC AORTIC TISSUE EXPRESSED IN PERCENTAGE OF NORMAL TISSUE OF THE SAME ARTERIAL SAMPLES.

Age Group (Years)	N	Wet Tissue %	Wet Tissue t of diff.	Tissue N %	Tissue N t of diff.
30–49	15	92	1.16	94	0.75
50–59	20	87	2.22	90	1.59
60–87	19	82	2.94	86	1.84
30–87	54	87	3.74	89	2.44

Pulmonary Artery Samples

The activity values for the individual pulmonary artery samples have been plotted in figure 3. Since the study included only 2 samples from individuals below the age of 20 years, a valid comparison of the activity values of samples from children and adults is not possible. The mean aconitase value observed for samples from adults was 0.025 millimoles of cis-aconitate metabolized/Gm. wet tissue/hour, and the corresponding value expressed on the basis of the tissue nitrogen content was 0.760. A calculation of the coefficients of correlation between age and aconitase activity for the samples from adults revealed r values of -0.26 (wet tissue weight; $t = 2.18$, $N = 66$) and -0.14 (tissue nitrogen content; $t = 1.14$, $N = 66$). One interesting observation with regard to the pulmonary artery tissue aconitase values is the marked tendency for the activity of this artery to exceed that of the aortic tissue. Thus a definitely higher aconitase activity of the pulmonary artery tissue than of the normal aortic tissue was recorded in 85% of the subjects, both when the activities were expressed on the basis of wet tissue weight and tissue nitrogen content. The mean values observed for the pulmonary artery samples were 136% (wet tissue) and 140% (tissue nitrogen) of those of the aortic samples, the t values of the differences being, respectively, 6.90 and 6.05.

DISCUSSION

The results obtained in the present study are in close agreement with the values reported in the previous publication from this department (2) and confirm the fact that the aconitase activity of human aortic tissue is considerably lower than the activities of isocitric dehydrogenase (1), fumarase (6), and malic dehydrogenase (3).

SUMMARY

Determinations were made of the aconitase activity of 115 samples of the thoracic descending aorta and 68 samples of the pulmonary artery obtained fresh at autopsy from individuals ranging in age from 3 weeks to 87 years. In the case of the aortic samples the enzyme activity measurements were made separately on normal and arteriosclerotic portions of the same blood vessels.

The average aconitase activities of normal aortic tissue samples from children and adults,

expressed as millimoles of cis-aconitate metabolized/Gm. wet tissue/hour, were, respectively, 0.027 and 0.019. In 85% of the cases the enzyme activity of the pulmonary artery tissue was found to be higher than that of the normal aortic tissue; the average value recorded for the pulmonary artery samples from adults was 0.025. The mean aconitase activity of arteriosclerotic aortic tissue portions was moderately lower than the activity exhibited by the normal tissue of the same blood vessels.

REFERENCES

1. Kirk, J. E.: The Isocitric Dehydrogenase and TPN-Malic Enzyme Activities of Arterial Tissue in Individuals of Various Ages. *J. Gerontol., 15:* 262-266, 1960.
2. Laursen, T. J. S., and Kirk, J. E.: The Presence of Aconitase and Fumarase in Human Aortic Tissue. *J. Gerontol., 10:* 26-30, 1955.
3. Matzke, J. R., Kirk, J. E., and Wang, I.: The Lactic and Malic Dehydrogenase Activities of Aortic and Pulmonary Artery Tissue in Individuals of Various Ages. *J. Gerontol., 12:* 279-283, 1957.
4. Natelson, S., Logovyi, J. K., and Pincus, J. B.: Determination of Micro Quantities of Citric Acid in Biological Fluids. *J. Biol. Chem., 170:* 597-606, 1947.
5. Pucher, G. W., Sherman, C. C., and Vickery, H. B.: A Method to Determine Small Amounts of Citric Acid in Biological Material. *J. Biol. Chem., 113:* 235-245, 1936.
6. Sørensen, L. B., and Kirk, J. E.: Variation with Age in the Fumarase Activity of Human Aortic and Pulmonary Artery Tissue. *J. Gerontol., 11:* 28-32, 1956.

RESPONSE OF GERIATRIC PATIENTS WITH PERIPHERAL VENOUS DISEASE TO TREATMENT WITH TRYPSIN*

HUGH L. MURPHY, M.D.†

We have previously reported (1) the results of treatment with intramuscular trypsin in patients with venous disorders, such as thrombophlebitis, varicose ulcers, and segmental venous thrombosis. A substantial number of the patients were elderly. We decided to continue the series to a point where comparison could be made between older and younger patients. Sixty years of age was arbitrarily taken as the dividing point.

The patients included are all those seen and treated in the office for the conditions described. There are 151 patients (43 men and 108 women) 60 years old or older and 150 patients (44 men and 106 women) under 60 years of age. The purpose of this presentation is to compare the incidence and the response to treatment of the two age groups.

METHOD

The therapy of all patients was standardized to include injections of 0.5 ml. of Parenzyme Aqueous®‡ containing 2.5 mg. of trypsin into the muscle tissue of the deltoid or the gluteal area once daily when acute inflammation was present and 3 times weekly thereafter until the patient was discharged from care. In some chronic cases it was found that the lesions recurred when treatment was discontinued, and thus these patients were maintained on weekly or bi-weekly treatments. Antibiotics were given during the acute phase, and physiotherapy, such as whirlpool baths, supportive elastic bandages, and hot compresses, was used as indicated. Limitation of standing at work was occasionally necessary in some patients to prevent orthostatic venous congestion, but in general the patients continued in their daily routine, and moderate locomotion was encouraged.

Therapy was continued on a regular schedule to maximum improvement. Local allergic reaction at the injection site, which occurred in 14% of the patients, was the only contraindication to continuation of treatment. The total number of injections administered to patients during office visits was used as a measure of the time required for treatment. Results were graded excellent (2+) if there was complete subsidence of subjective and objective clinical morbidity, good (1+) if there was marked improvement, and poor (0) if there was inadequate or unsatisfactory clinical improvement. The duration of treatment was not considered in the grading of the results but was recorded as an additional indication of responsiveness of the patients.

RESULTS

The sex and the drug reactions encountered in patients under 60 and in those 60 and over in each of the clinical conditions analyzed are shown in table 1.

The men and the women responded about equally. Side reactions were somewhat more frequent in women than in men: 15.0% of the women incurred reactions compared to 10.3% of the men. Of the total of 41 patients in whom therapy was discontinued because of local reaction, 17 patients were 60 years or over and 24 were under 60 years of age.

In figure 1, the frequency of the venous conditions treated is shown according to the age of the patients. In all of the clinical conditions included, there were as many or more patients in the 60-69 group as in any other decade of life. In the whole series, 117 of 301, or 39%, were in this age group, and in the case of varicose ulcers, the incidence was 47%.

In table 2, the response to therapy and the average number of treatments required is shown for each of the age groups. The total number of treatments ranged from 2 to 96 at the time of writing. The patient who has had 96 injections is being continued on bi-weekly treatments to prevent recurrence. This 68-year-old woman has had recurrence of cellulitis on two occasions when treatment was stopped.

The result of therapy is very similar in the two age groups, those 60 years of age and over being graded excellent in 78% of the cases and those under 60 years of age in 77%. About

* Presented at the joint meeting of the Brooklyn Surgical Society and the staff of the U.S. Naval Hospital, St. Albans, New York.

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‡ The National Drug Company, Philadelphia, Pennsylvania.

TABLE 1. DIAGNOSIS OF TYPES OF LESION PRESENT IN 301 PATIENTS. THE FIGURES IN PARENTHESIS REPRESENT THE NUMBER OF PATIENTS IN EACH GROUP WITHDRAWN FROM MEDICATION BECAUSE OF REACTIONS.

Diagnosis	Total No.	60 and Over		Under 60	
		Men	Women	Men	Women
Varicose ulcers	57	10 (0)	23 (1)	12 (2)	12 (2)
Segmental venous thrombosis	39	7 (0)	8 (0)	10 (1)	14 (2)
Thrombophlebitis, chronic with lymphedema	63	4 (0)	23 (4)	7 (1)	29 (5)
Subacute and chronic with ulcer, dermatitis and/or cellulitis	106	20 (2)	39 (9)	14 (3)	33 (5)
Subacute—superficial with venospasm	36	2 (0)	15 (1)	1 (0)	18 (3)
Total	301	43 (2)	108 (15)	44 (7)	106 (17)

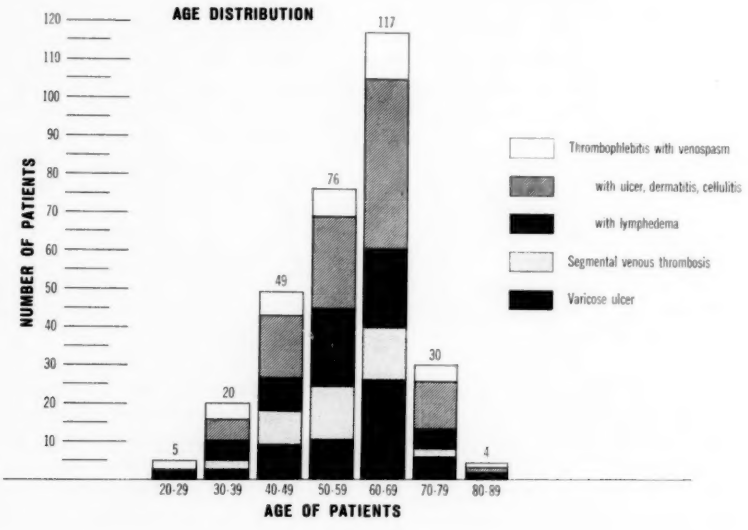

Fig. 1

TABLE 2. THE AVERAGE, MEDIAN, AND RANGE OF THE NUMBER OF TREATMENTS AND THE RESULTS ACHIEVED IN EACH AGE GROUP ACCORDING TO DIAGNOSIS.

Diagnosis	No. of Patients	Results			No. of Treatments		
		2+	1+	0	Average	Median	Range
Varicose Ulcer							
60 and over	33	31	2	0	14	17	3–50
under 60	24	24	0	0	11	8	2–44
Segmental venous thrombosis							
60 and over	15	15	0	0	17	15	4–40
under 60	24	22	1	1	7	7	2–21
Thrombophlebitis, chronic with lymphedema							
60 and over	27	13	14	0	15	12	3–65
under 60	36	15	18	3	12	10	3–37
Subacute and chronic with ulcer, dermatitis and/or cellulitis							
60 and over	59	44	10	5	18	10	3–96
under 60	47	39	5	3	12	10	2–40
Subacute, superficial with venospasm							
60 and over	17	15	2	0	14	11	2–56
under 60	19	15	3	1	10	9	3–24
Total							
60 and over	151	118	28	5	16		
under 60	150	115	27	8	11		

TABLE 3. THE INFLUENCE OF INCREASING THE NUMBER OF TREATMENTS ON THE FINAL RESULTS OF THERAPY IN THE PATIENTS 60 YEARS OLD AND OLDER.

Diagnosis	No. of Patients		No. of Treatments (Average)		Results					
					Former Study			Treated Since		
	In Former Study	Treated Since	Former Study	Treated Since	2+	1+	0	2+	1+	0
Varicose ulcers	21	12	10	13	20	1	0	11	1	0
Segmental venous thrombosis	11	4	12	31	11	0	0	4	0	0
Thrombophlebitis, chronic with lymphedema	21	6	13	15	8	13	0	5	1	0
Subacute and chronic with ulcer, dermatitis and/or cellulitis	29	30	15	17	21	7	1	23	3	4
Subacute—superficial with venospasm	4	13	8	14	3	1	0	12	1	0
Total	86	65	12	20	63	22	1	55	6	4

45% more treatments were required in the older age group. However, the results are influenced by persistence in treatment. In table 3, a breakdown is shown between the patients 60 years of age and over treated in the 3 years prior to our previous report and those treated in the 2 years since. An analysis of the tables reveals that excellent results increased from 73% when an average of 12 treatments were given to 85% when the number of treatments was increased to 20.

DISCUSSION

Older patients apparently respond to intramuscular trypsin injections just as well, but not as rapidly as younger ones. This is borne out by the observation that of the 34 patients in the series who were 70 years of age or over, 27, or 79%, were graded excellent, 5 good and 2 poor. They received an average of 14 treatments, which seems somewhat low in relation to the best results obtained in the entire group of 60 years of age and older. However, for some reason, the side reaction rate was high in these patients; 7 of the 34 had to be withdrawn from treatment before we were satisfied that best results had been achieved. All 7 of those with side reactions were women. There were 28 women and 6 men in the 70-year-and-over group.

The patients included in this series were those deemed suitable for office and ambulatory treatment. All patients with phlebothrombosis were hospitalized and were given anticoagulants in addition to the trypsin. Eliminating this group, there were 301 patients who came to the office with one of the venous disorders specified above. One patient required hospitalization because of a deterioration in his condition. This was a 58-year-old man with an ankylosed hip joint who had chronic thrombophlebitis with ulcers. His activity was reduced and he did not keep his appointments nor follow instructions. The ulcers attending his thrombophlebitis worsened, but he refused to be hospitalized. Subsequently a pulmonary infarct developed which required hospitalization.

A factor which could not be evaluated in this series was the influence of activity on response to treatment. Restrictions were put only on those patients who had to stand still in their daily occupation. All were encouraged to maintain moderate activity, and more severe cases were given physical therapy treatments. In patients 60 years old and over, activity is usually reduced physiologically. There is less natural response of venous circulation because of sedentary habits. It is our impression that this factor accounted for the longer time needed by the geriatric patient for response. Improvement depends more on specific medical care than in the younger patient who has a greater natural response. The fact that older patients with venous disease do respond as well, although not as quickly, points out the desirability of a rigorous treatment program to restore them to pain-free activity.

We want to stress the responsiveness of older patients to the trypsin treatment. Too often people at or near the retirement age are relegated to the rocking chair and told they must not walk around because their leg pain could become much worse. This reasoning is fallacious and contrary to the best interest of these patients. A treatment program designed to stimulate and restore venous circulation can rehabilitate the older patient and should be used to the best advantage.

SUMMARY

One hundred fifty-one geriatric patients with thrombophlebitis, varicose ulcers, or segmental venous thrombosis were treated with Parenzyme Aqueous®, antibiotics, and supportive therapy. The results were compared with a group of 150 patients under 60 years of age suffering from the same disease processes and treated by the same regimen. Excellent results were obtained in 78% of the older patients and in 77% of the younger patients. The time required to achieve equal results was about 45% longer in the older patients. With the method of treatment outlined, only one of 301 patients worsened and required hospitalization.

REFERENCE

1. Murphy, H.: Trypsin in Peripheral Vascular Diseases. Review and Report of Treatment of 210 Patients. *New York J. Med., 59:* 1973-1980, 1959.

EVALUATION OF TREATMENT WITH FORTIFIED CHORIONIC GONADOTROPIN WITH SPECIAL REFERENCE TO DISEASE CONDITIONS IN ELDERLY SUBJECTS

FREDERIC DAMRAU, M.D.*

The value of chorionic gonadotropin for stimulation of the androgenic function of the Leydig cells in the testicles has been fully established (1, 2, 5). Some studies have shown that the male climacteric may be considered a clinical entity and have linked this syndrome with a decline of endocrine gonadal function (4, 6, 7).

Further investigations have indicated that fortification of chorionic gonadotropin with thiamine hydrochloride and L (+) glutamic acid provides an enhanced therapeutic effect by reason of the synergism between these three ingredients (3).

The purpose of the present study was to evaluate fortified chorionic gonadotropin† in comparison with chorionic gonadotropin itself by a double blind test of the therapeutic results obtained with both drugs and a placebo on the same group of patients. Naturally it was impossible to compare the medications in all cases; but, since the group was rather homogeneous, the result of the comparison when studied as an average is quite consistent.

The ordinary, non-fortified chorionic gonadotropin used in this comparison contained 200 i.u. per cc. The active ingredients of the fortified chorionic gonadotropin per 1 cc. were as follows: chorionic gonadotropin, 200 i.u.; thiamine hydrochloride, 25 mg.; L (+) glutamic acid, 52.5 ppm., chlorobutanol, 0.5%; procaine hydrochloride, 1.0%. The small amount of L (+) glutamic acid in the formula is believed to act as a catalyst. The chlorobutanol and procaine hydrochloride serve as local anesthetics. The dosage schedule was the same for both drugs, namely, 1 cc. intramuscularly twice a week for the first month and thereafter once a week for maintenance.

CLINICAL MATERIAL

The patients were observed over a period of several years in an institution for the aged, in private practice, and by reference from physicians who sent their patients specifically for the treatment outlined.

The group studied consisted of 57 men ranging in age from 35 to 94, average 57 years. One patient was in the 30's, 16 in the 40's, 20 in the 50's, 12 in the 60's, 5 in the 70's, 2 in the 80's, and 1 in the 90's. The weight range was from 120 to 222 lb., average 167 lb.; height from 65 to 72 in., average 69 in.

A clinical diagnosis of male climacteric (6, 7) was made in 43 cases, coronary disease in 15, angina pectoris in 10, chronic myocarditis in 8, hypertension in 5, and psychosis in 4. The average duration of the complaint on admission was 3.8 years (range 0.2 to 38 years). In all cases of coronary disease the diagnosis was made on the basis of objective evidence and confirmed by the EKG.

All 57 patients of the group were treated with injections of fortified chorionic gonadotropin during a period of observation averaging two months. For comparison of results, 27 patients from the same group were treated with ordinary chorionic gonadotropin and 36 with a placebo or no medication during comparable periods. All of the controls were matched against cases treated with fortified chorionic gonadotropin.

SYMPTOMATIC RELIEF

The principal symptoms were excessive fatigue in 34 cases, loss of business and social interest in 31, depression in 25, loss of libido (with more or less impotence) in 24, irritability in 22, insomnia in 14, and anorexia in 11.

Table 1 shows a comparison of results with fortified chorionic gonadotropin, ordinary chorionic gonadotropin, and placebo. The therapeutic response to fortified chorionic gonadotropin was significantly better for all of the 7 symptoms studied.

INDEX OF CARDIOVASCULAR EFFICIENCY

Cardiovascular efficiency represents the ability of the heart and vascular system to react to physical stress, such as standard exercise tests.

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† Supplied for this investigation as Glukor® ampuls by Research Supplies, Albany, New York.

TABLE 1. COMPARISON OF THERAPEUTIC RESULTS WITH FORTIFIED AND ORDINARY CHORIONIC GONADOTROPIN.

Symptoms	Incidence	Fortified Chorionic Gonadotropin (57 Cases)				Ordinary Chorionic Gonadotropin (27 Cases)				Controls (36 Cases)			
		ST	CR	I	F	ST	CR	I	F	ST	CR	I	F
Excessive fatigue	34	34	82%	18%	0	16	0	47%	53%	31	0	4%	96%
Loss of business and social interest	31	31	90%	10%	0	20	0	45%	55%	29	0	9%	91%
Depression	25	25	92%	8%	0	14	0	43%	57%	25	0	9%	91%
Loss of libido (with more or less impotence)	24	24	96%	0	4%	11	0	36%	64%	24	0	10%	90%
Irritability	22	22	86%	14%	0	11	0	45%	55%	20	0	7%	93%
Insomnia	14	14	93%	7%	0	7	0	29%	71%	16	0	8%	92%
Anorexia	11	11	91%	9%	0	6	0	20%	80%	10	0	14%	86%
Composite symptomatic response	161	161	89%	10%	1%	85	0	41%	59%	155	0	8%	92%

ST—Number of cases with listed symptoms treated.
CR—Complete relief.
I—Improvement.
F—Failure.

For patients capable of a moderate degree of exercise, standing on and off a platform 12 in. high with alternate feet at a rate of once every 5 seconds for a period of two minutes constituted the exercise test. For those who could not tolerate this type of exercise because of cardiac damage, the standard exercise consisted of walking very slowly back and forth the length of a 10 ft. room, one length every 15 seconds, for a period of two minutes. In either case the exercise test remained constant for each type of medication throughout the comparison series.

Measurements indicating the rise in systolic blood pressure immediately after the standard exercise showed the extent of stress on the cardiovascular system. Persons with extremely poor reactions showed a change in blood pressure indicating stress upon the slightest exertion, while those in good health showed no change. The degree of rise in systolic blood pressure, when compared with the level before exercise, indicated the tone of the whole cardiovascular system. The normal individual with a healthy cardiovascular system does not show an increase in systolic blood pressure greater than 5-10 mm. Hg, and often there is no increase at all.

The measurement of pulse recovery was performed by taking the pulse rate immediately at the end of the exercise period. After resting in a chair for two minutes, the pulse was again recorded. The figure of absolute recovery, which is the difference between the higher rate at the end of exercise and the lower rate at the end of two minutes of rest, compared with how closely the pulse rate returns to the normal rate for a particular subject while sitting, is a good indication of the degree of conditioning, particularly with reference to the state of the heart. The pulse rate after exercise of this type may rise as high as 15 beats per minute but usually not more than 5-7, and in healthy individuals the recovery after two minutes at rest was usually complete. Age, physical stress, emotional disturbance, and psychic insult all contribute to lowering the index of cardiovascular efficiency.

Any course of medication which affects the above objective signs favorably can be said to have a salutary influence on the cardiovascular system.

The effects of treatment on blood pressure elevation after the standard exercise are shown in table 2. It will be noted that elevation of blood pressure following the standard exercise was significantly less after treatment with fortified chorionic gonadotropin.

TABLE 2. EFFECT OF TREATMENT ON BLOOD PRESSURE ELEVATION FOLLOWING 2 MINUTE STANDARD EXERCISE TEST ON 44 SUBJECTS.

Medication	Mean Elevation of Systolic Pressure mm. Hg.	Range
Before treatment	17.7	0-30
Fortified chorionic gonadotropin	8.7	0-28
Ordinary chorionic gonadotropin	17.6	0-32
Placebo or no medication	18.0	0-30

TABLE 3. EFFECT OF TREATMENT ON PULSE RATE RECOVERY FOLLOWING 2 MINUTE STANDARD EXERCISE TEST ON 44 SUBJECTS.

Medication	Mean Number of Beats Recovered	Range	Recovery of Ability to Exercise
Before treatment	5.0	0-15	—
Fortified chorionic gonadotropin	10.0	0-18	90%
Ordinary chorionic gonadotropin	5.5	0- 9	20%
Placebo or no medication	4.8	0-10	0

The effects of treatment on pulse rate recovery after the standard exercise are shown in table 3. It will be noted that pulse rate recovery following the standard exercise was significantly better with fortified chorionic gonadotropin.

Fortified chorionic gonadotropin provides the treatment of choice in cases of the male climacteric. It is also useful to correct hypogonadism associated with coronary disease, angina pectoris, and male senility.

SUMMARY

A double blind comparison study was made of fortified chorionic gonadotropin, ordinary chorionic gonadotropin, and a placebo in a group of 57 men (age range 35 to 94) suffering mainly from the male climacteric, coronary disease, or angina pectoris. In all cases of coronary disease the diagnosis was confirmed by the EKG.

On the basis of symptomatic and improved cardiovascular efficiency, therapeutic results with fortified chorionic gonadotropin were definitely superior.

The subjective index of therapeutic response was 99% for fortified chorionic gonadotropin, 41% for ordinary chorionic gonadotropin, and 8% for the controls.

In almost all cases a course of treatment with fortified chorionic gonadotropin completely relieved the symptoms of excessive fatigue, loss of business and social interest, depression, loss of sexual libido (with more or less impotence), irritability, insomnia, and anorexia.

The index of cardiovascular efficiency showed much greater improvement after a standard course of treatment with fortified chorionic gonadotropin than with ordinary chorionic gonadotropin.

REFERENCES

1. A.M.A. Council on Drugs: *New and Nonofficial Drugs*, J. B. Lippincott, Philadelphia, 1960, p. 598.
2. de Bodo, R. C., and Altszuler, N.: Hormones of the Pituitary Gland and Substitution Therapy. In: *Drill's Pharmacology in Medicine*, 2nd ed., Blakiston, New York, 1958, pp. 933-953.
3. Gould, W. L.: A New Therapeutic Approach to Aging. *Clin. Med., 4:* 865-868, 1957.
4. Heller, C. G., and Myers, G. B.: The Male Climacteric, Its Symptomatology, Diagnosis and Treatment, *J.A.M.A., 126:* 472-477, 1944.
5. Sollmann, T.: *Manual of Pharmacology*, 8th ed. W. B. Saunders, Philadelphia, 1957, p. 611.
6. Werner, A. A.: The Male Climacteric, Report of 54 Cases. *J.A.M.A., 127:* 705-710, 1945.
7. Werner, A. A.: The Male Climacteric, Report of 273 Cases, *J.A.M.A., 132:* 188-194, 1946.

GERONTOLOGICAL ACTIVITIES IN ARGENTINA

MIGUEL C. LASCALEA

Problems of gerontology create increasing interest every year in our country. The most discussed aspect is geriatric medicine, particularly in the areas of clinical pathology and therapeutics, but gerontological research and medical-social problems of aging and old age have also received increasing attention.

The principal center of gerontological activity has continued being the Sociedad Argentina de Gerontología y Geriatría (Argentine Society of Gerontology and Geriatrics). This Society developed its activity by means of ordinary monthly sessions, joint meetings with other medical societies, and special meetings or postgraduate courses in the interior of the country. Thirty-six scientific papers were presented in the regular sessions during 1957-1959.

One of the joint meetings was held with the Asociación Argentina de Nutrición y Dietología (October, 1958) and the subject, Needs of the Elderly (1) was discussed. Enrique Villa discussed the physiopathological aspects, Campagnoli the clinical aspects, and Manuel Beguiristain and Jorge Ragusin Curutchet the therapeutical aspects. The subject of insulin and sulfa drugs was presented by Carlos Albariñas and R. Camerini Dávalos. At another joint meeting, with the Sociedad Argentina de Medicina Interna (December, 1959), a symposium on heart diseases in old age took place. The subjects were Physiological Aging of the Heart, Miguel C. Lascalea; Heart Diseases in Senescence (Atherosclerotic and Hypertensive Cardiopathy), Osvaldo Fustinoni; Chronic Cor Pulmonale, Jorge Burucúa; Other Cardiopathies of the Aged, Hector Mosso; Heart Failure in the Senile, H. A. Ruggiero.

Two postgraduate courses were held in this country, one of them in Salta (July, 1959) and the other in San Juan (April, 1960). A series of 15 conferences and a final round table discussion were presented in both courses. The subject of the first course was General Aspects of Clinical Pathology in Geriatrics and that of the second was Diagnosis and Therapy in Geriatrics. Miguel C. Lascalea conducted postgraduate courses in gerontology and geriatrics during 1957-1959 in the Faculty of Medicine of Buenos Aires.

Atherosclerosis was one of the preferred subjects in the area of clinical or experimental research. Results of these investigations were published or presented at the meetings of the medical societies. A large number of the papers were presented at the First Congress of Atherosclerosis (Buenos Aires, July, 1959) and at the First Río Plata Congress of Internal Medicine (Buenos Aires, November, 1959).

Ernesto A. Röttjer, Miguel C. Lascalea, and León Salganikoff (2, 3) studied the electrophoretic proteinograms in 62 old patients. They found that the amount of proteins in the different fractions in elderly apparently normal individuals with normal physical activity is more or less similar to that of the young or middle-aged normal persons but there is tendency toward a decrease in the albumin levels and an increase in $beta_2$, $alpha_2$, and gamma globulins. In old patients with evidence of atherosclerosis but without localized vascular accidents definite and more marked changes are found; there is also increase in the $alpha_1$ globulin level. This means that aging and atherosclerosis determine such changes in the electrophorogram. In patients with definite atherosclerosis in some vascular areas (coronary, cerebral, peripheral arteries, or abdominal aorta) it was found that changes of the proteins are still more evident. In summary, the most typical change in atherosclerosis is the alpha and beta globulin increase, specially in patients with recent infarct, and sometimes in cerebral vascular disease with or without recent accident; it is believed that the increase in the $alpha_2$ globulin is in connection with the parenchymal necrosis resulting from the arterial occlusions. When atherosclerosis appears without evident vascular accident, it is believed that unknown small necrotic foci may be responsible. The increase of the beta globulin fraction is connected with the increase of lipids in that disease.

Ernesto A. Röttjer, Miguel C. Lascalea, and León Salganikoff (2, 3) also studied the amount of total cholesterol, beta lipoprotein cholesterol, and beta lipoprotein protein in healthy old people and in patients with uncomplicated atherosclerosis or with atherosclerosis associated with organic disease (coronary, cerebral, or peripheral artery disease, or aneurism of the aorta). The biochemical pattern shows that the cholesterol and beta lipoprotein cholesterol are the same in apparently normal old people and healthy younger people, but the lipoprotein protein is higher in the first group.

Atherosclerotic patients show increases in the levels of the three elements, the increase being more evident in patients with angina pectoris or infarct than in patients with cerebral vascular disease with or without recent cerebral vascular accident. It was further shown that changes are greater and more constant in beta lipoprotein cholesterol, in the index beta lipoprotein cholesterol/total cholesterol and in the lipoprotein protein, than in the total cholesterol values.

In some patients some of these factors could be normal, but never in the patients with coronary disease were the three factors, total cholesterol, beta lipoprotein cholesterol, and beta lipoprotein protein, normal at the same time. When old and young patients with coronary disease were compared, it was found that the increase in the levels of these substances was more evident and constant in the latter group. Therefore, it is believed that the determination of beta lipoprotein cholesterol and beta lipoprotein protein in atherosclerosis is more useful than the determination of the total cholesterol alone. Their increase would show a tendency to the coronary or cerebral localization of the disease.

José A. Marra, Domingo Carrera, Julio D'Oliveira, and León Salganikoff (4) found in coronary patients a close connection between the biochemical factors mentioned above and the clinical severity of the disease. When the clinical intensity or severity of the disease was greater, the amount of beta lipoprotein cholesterol

and the total cholesterol were greater also. Total cholesterol was the less sensitive of these elements.

Héctor Mosso and Celina M. Burrier (5) corroborated the observation that investigations of the blood lipoprotein (electrophoresis) are more useful than the chemical determination of the cholesterol and lipids in patients with atherosclerosis or angina pectoris. They found a decrease in the amount of alpha lipoprotein and an increase in beta lipoprotein/alpha lipoprotein index.

Alfredo Buzzi, Raúl M. Laplacette, Atilio Piccaluga, and Jorge Boschetti (6) found a pre-beta lipoprotein fraction in the blood electrophoresis of atherosclerotic patients. Such a fraction is still present in patients with normal total cholesterol and normal Antonini index. Egidio Mazzei and Celina M. Burrier (7, 8) made similar observations in old age, atherosclerosis, and coronary disease (angina pectoris and infarct principally).

Héctor Mosso (3) administered nicotinic acid (0.5 to 2.0 Gm. daily) to elderly patients and observed a decrease in beta lipoprotein, and a lowering of cholesterol and total lipids in more than half of the patients; such results are not conclusive.

León De Soldati, G. Stritzler and S. Balassanian (9) using the same therapy (1 to 4 Gm. daily) obtained different results depending on the initial level of plasma cholesterol. When the cholesterol concentration was high, the drug was found to be much more effective in lowering the levels, not only of total cholesterol, but of both free and esterified cholesterol, fatty acids, and total lipids; these values were occasionally reduced to about 40% of their original concentrations. When the original cholesterol level was normal, practically no effect on the different lipid compounds was observed.

A study was made by Manuel Malinow (10) on the effect of estrogens on atherosclerosis. Prevention of coronary atherosclerosis or regression of coronary disease induced through feeding of cholesterol to chickens was achieved by administration of estradiol benzoate. Similar findings were made with regard to atherosclerotic lesions of the aorta, coronary artery, and renal artery in rats, and the aorta and renal artery in male rabbits. The intravenous administration of estradiol benzoate in the form of micro-crystals had a smaller endocrine effect than the intramuscular injection; in contrast to this an oil emulsion of estradiol was found to produce a greater effect when given intravenously than intramuscularly. Injection of radioactive estradiol showed that this compound is deposited in the arterial wall and particularly in the atheromatous plaques. This hormone acts upon the enzymes in the arterial wall (alkaline phosphatase) thus influencing local tissue metabolism.

Ernesto A. Röttjer, Miguel C. Lascalea, Felix Cantarovich, and Carlos Mautalen (3) have reported favorable effects of treating obliterating endarteritis in old subjects with intraarterial injections of histamin.

A beneficial effect of treating hypertension with chlorothiazide was observed by Miguel C. Lascalea, Felix Cantarovich, Victorino C. Potente, and Clodomiro Risau (11) in 63% of elderly subjects; when the drug was given in combination with small doses of iproniazide, the favorable response increased to 92%.

In the geriatric department of the Central Military Hospital special studies have been conducted on clinical symptoms and laboratory findings in various hepatic diseases in elderly subjects. Miguel C. Lascalea, León Salganikoff, Ramon Latienda, and Victorino Potente (12) made flocculation tests, electrophoretic plasma protein studies, and bromsulphalein tests in 20 cases which showed no other clinical symptoms than those related to atherosclerosis; in some instances, liver needle biopsy was also performed. In 75% of the patients the flocculation test was postive; 50% of the subjects exhibited a notable reduction in the albumin content of the plasma (average value, 3.4 Gm. per 100 ml.), and a definite increase in the gamma globulin fraction (average value, 2.1 Gm. per 100 ml.) was noted in all the cases. The bromsulphalein test showed abnormal findings in half the patients, and liver needle biopsies revealed cholangiohepatitis with incipient cirrhosis, cholangitis, or cirrhosis.

The medical and social aspects of the problems of the elderly are regarded with greater interest in Argentina. Jornadas de la Ancianidad (old age days), organized by the Ministerio de Asistencia Social y Salud Pública de la Nación (Ministry of Social Assistance and Public Health of the Nation) were held May 20-22, 1959. Management of the socio-medical problems of the aged was discussed, and recognition of geriatrics as a medical specialty was proposed. The establishment of a Consejo Nacional de la Ancianidad (National Council on Old Age), to study and assess the problems of old people, and a board of socio-medical assistance to the elderly were also considered. As a result of the Jornadas, a Permanent Commission for the Welfare of the Aged was established under the Ministerio de Asistencia Social y Salud Pública. All over the country private organizations have provided hospitals for the chronically ill and aged and homes for the aged. The County and City of Buenos Aires has established a Consejo Asesor de Geriatría (Advisory Council in Geriatrics) to integrate the knowledge of physicians of the various specialties and give advice to the Secretario de la Salud Pública in order to provide a solution to the medical problems which confront elderly people.

REFERENCES

1. Villa, E., Beguiristain, M., Curutchet Ragusin, J., Albariñas, C., and Camerini Dávalos, R.: Las Carencias en Geriatría. Insulina y Sulfodrogas en la Diabetes del Senil, *Rev. Asoc. méd. argent.*, *46:* 215, 1959.
2. *Actas del 1° Congreso Americano de la Atheroesclerosis:* Buenos Aires, July, 1959.
3. *Actas del 1° Congreso Rioplatense de Medicina Interna.* Buenos Aires, October, 1959, Edit. Universitario (In press).
4. Marra, J. A., Carrera, D., D'Oliveira, J. R., and Salganikoff, L.: *Communicac. 3° Congreso Nacional de Cardiología,* Tucumán, September, 1953.
5. Mosso, H., and Burrier, C. N.: El Lipidograma Electroforético en Pacientes con A.E. y Angina de Pecho. *Prensa méd. argent.*, *45:* 2790, 1958.
6. Buzzi, A., Laplacette, R. M., Piccaluga, A., and Boschetti, J.: El Lipidograma Electroforético en la A.E. Coronaria y Periférica. *Orientación Méd. 9:* 265, 1960.
7. Mazzei, E., and Burrier, C. N.: El Lipidograma Electroforético Normal y en la A.E. Su Correlación con la Valoración Química de los Lípidos. *Prensa méd. argent., 45:* 5, 1958.
8. Mazzei, E., Burrier, C. N., De La Riega, F., and Barrera, F.: El Lipidograma Electroforético en la Angina de Pecho y el Infarto de Miocardio. Su Valor En Relación con la Determinación Química de los Lípidos Séricos. A Propósito de 100 Observaciones. *Prensa méd. argent., 40:* 215, 1959.
9. De Soldati, L., Stritzler, G., and Balassanian S.: Acción del Acido Nicotínico Sobre los Lípidos de la Sangre en Pacientes A.E. *Prensa méd. argent., 44:* 3286, 1957, and *Cardiologia,* 35: 84, 1959.
10. Malinow, M. R.: The Effects of Estrogens on Experimental Atherosclerosis. *Acta Physiol. Latino Americana, 9:* 313, 1959.
11. Lascalea, M. C., Cantarovich, F., Potente, V., and Risau, C.: *Tratamiento de la Hipertensión Arterial en Geriatría con Clorotiazida.* Comun. a la Soc. Arg. de Gerontol. y Geriatría. August, 1959.
12. Lascalea, M. C., Salganikoff, L., Latienda R., and Potente, V.: *Anormalidades de los "Tests" de Funcionalismo Hepático en Gerontes con Hepatopatías inaparentes.* Com. de la Soc. Arg. de Gerontología y Geriatría. June, 1959.

GERONTOLOGICAL ACTIVITIES IN SWEDEN

STEN ECKERSTRÖM

During the three years since my last report the development of gerontological activities in Sweden has been concerned with both medical and social problems.

Interest in geriatric research is improving, as is activity in some other sections of the Swedish medical associations. At the annual meeting of the Swedish Association of Physicians in Stockholm in December, 1959, the Geriatric Section had the pleasure of having Dr. Marjory Warren of Isleworth, England, as a distinguished guest. Dr. Warren presented her opinion about the general principles of geriatric medicine, and her lecture was followed by a discussion on the great importance of the early commencement of physiotherapy and rehabilitation for old people. Among the other problems discussed at the meeting were the cause of atheromatosis (Prof. Malmros), folic acid standard and clearance in the blood of old people (Dr. Hansen and Dr. Nyström), morbidity changes with increasing age (Dr. Sallstrand), ophthalmological aspects of aging (Dr. Carle), and cerebral vascular disease (Dr. Eckerström).

The Geriatric Section held its annual meeting in Norrköping in April, 1959, where various practical medical and psychiatric problems were discussed in connection with an exhibition illustrating the importance of rehabilitation and employment as a source of health (Dr. Butler).

At the meeting in October, 1959, of the Section of Geriatric Medicine of the Medical Society of Göteborg, a symposium on cerebrovascular disease was held, where Dr. Dalsgaard-Nielsen (Copenhagen) presented data on diagnosis and therapy in acute cerebrovascular diseases derived from about 2,500 cases of acute cerebral catastrophies. General aspects of the problem, such as neuroradiological and neurosurgical aspects, were presented by various members of the Society.

International contacts have improved during the last few years. People from abroad are coming to Sweden in order to study how we try to solve problems on the care of aged people, and Swedes are going to European countries to obtain ideas and to discuss common problems.

The mutual issues in the Scandinavian countries have led to a close contact among people who are working in geriatric medicine and gerontology in these countries. There is a Scandinavian committee working on the practical problems of the care of the elderly, and regular meetings are arranged every third year.

With regard to interest in international contacts, there was a group of Swedish geriatricians and gerontologists present at the Fourth Congress of the International Association of Gerontology in July, 1957, at Merano and Venice, Italy, and at the meetings of the European Clinical Section of the I.A.G. in Sunderland, England, in October, 1958. At Nancy-Vitelle, France, in June, 1959, a Swedish delegate participated in the meetings with lectures and discussions.

There are many practical problems dominating the interest of Swedish authorities today. The lack of beds for geriatric patients with long-term diseases in general hospitals has forced the building of homes for patients with chronic diseases. In spite of this, there still are many sick and disabled old people in old people's homes who are in need of more qualified medical care. During the last few years consultations for out-patients in connection with geriatric hospitals or units were initiated in order to lighten the demand for hospital beds. In addition, resources for home care have gradually increased. However, there seems to be no doubt that the increase in the population of old people will strain the resources of Swedish hospitals very heavily during the coming decades. It is not a surprising discovery that every county council and every large city of this country came to this conclusion. Needs are rising very rapidly and will increase at a more accelerated speed than was presumed earlier. The number of people more than 65 years old is increasing by 15,000 every year. About 1970 is it estimated that the number of people in this age group will be one million out of a total population of about 8 million.

Investigation has shown that almost half of the patients in medical wards of general hospitals are more than 60 years old. Between 75% and 80% of all patients with chronic diseases are old people. The fast-increasing number of the elderly must evidently influence the demand for hospital beds, and the possibilities of decreasing this need by prophylactic steps should not be overestimated. Length of life will probably increase as gerontological research advances, but finally the old person will reach the stage where his health will decrease more rapidly.

We all agree more or less that the planned improvement in the hospital care of sick people will not be sufficient to take care of all old people in need of nursing. However, to a considerable extent, and against modern principles of care of the elderly, old people's homes now have to admit patients who are not in acute need of hospital treatment but who are in need of help. Thus, hard reality prevents old people's homes from developing into homes for comparatively healthy but yet aged people. It seems, therefore, realistic that the municipalities concentrate on supplying individual sick-wards for those homes. Even if the nursing situation gradually improves, old people's homes will still have to take care of the invalids among the elderly who are not in need of care in hospitals for the chronically ill.

During the last few years many publications by Swedish authors have dealt with problems of interest from a geriatric point of view.

In 1959, Frisk and associates (9) published a wide-scale health survey, Stockholm's City Health Survey of 1954, with the purpose of examining every individual among a representative selection of the Stockholm population. The survey was based upon physical examination and a carefully recorded medical history. In 1957, 1958, and 1959, Biörck and associates (4, 5, 6, 7) reported on studies of myocardial infarction in Malmö, 1935-1954, the morbidity from myocardial infarction in

a hospital material, and the aspects of the frequency of that disease in certain occupational groups of that material. They made an attempt to estimate the total incidence of acute myocardial infarction in the population of Malmö and found the frequency likely to be 15 to 20 per 10,000 inhabitants a year.

An interesting study on occupational mortality was published in 1959 by Ask-Upmark of Upsala (1): the author compared the mortality of Swedish university men, printers, street car operators, and American physicians. The latter category was used for comparison with conditions in Sweden, and it was found that their average lifespan approached that of the Swedish university men.

In the University Medical Clinic of Lund there is a team under the direction of Prof. Malmros working on the problems of arteriosclerosis, the effect of diets containing differents fats on serum-cholesterol and atherosclerosis, and deficiency of essential fatty acids (13, 14).

From the Institute of Anatomy, University of Göteborg, there were published papers on the problems of osteoarthritis by Ekholm (8) and muscular atrophy and fat content of muscular tissue by Helander (10, 11, 12).

During the last few years the general problems of physical work capacity of older people were studied by Åstrand (2, 3), at the Department of Physiology of the Gymnastic Central Institute, Stockholm. The maximal oxygen intake for manual workers was found to be very much lower than for younger people and so were the maximal heart rate and the maximal blood lactic acid concentration. The probable limiting factors for older people when performing muscular work were also discussed.

REFERENCES

1. Ask-Upmark, E.: How Did They Die? A Study of the Occupational Mortality in Three Swedish Professions. *Acta med. scandinav., 163:* 89-104, 1959.
2. Åstrand, I.: The Physical Work Capacity of Workers 50-64 Years Old. *Acta physiol. scandinav., 42:* 73-86, 1958.
3. Åstrand, I.: Clinical and Physiological Studies of Manual Workers 50-64 Years Old at Rest and During Work. *Acta med. scandinav., 162:* 155-164, 1958.
4. Biörck, G., Blomqvist, G., and Sievers, J.: Studies on Myocardial Infarction in Malmö 1935 to 1954. I. Morbidity and Mortality in a Hospital Material. *Acta med. scandinav., 159:* 253-274, 1947.
5. Biörck, G., Blomqvist, G., and Sievers, J.: Studies on Myocardial Infarction in Malmö 1935-1954. II. Infarction Rate by Occupational Group. *Acta med. scandinav., 161:* 21-32, 1958.
6. Biörck, G., Sievers, J., and Blomqvist, G.: Studies on Myocardial Infarction in Malmö 1935 - 1954. III. Follow-up Studies from a Hospital Material. *Acta med. scandinav., 162:* 81-97, 1958.
7. Biörck, G., Blomqvist, G., and Sievers, J.: Studies on Myocardial Infarction in Malmö 1935 to 1954. IV. Myocardial Infarction in the Hospital in Relation to Coronary Heart Disease in the Population. A Study Based on a Combined Clinical, Autopsy, and Death Certificate Material. *Acta med. scandinav., 165:* 1-15, 1959.
8. Ekholm, R.: Osteo-arthritis in the Knee-Joint with Special References to the Weightbearing in the Joint. *Acta morph. neerl. scandinav., 1:* 63-69, 1956.
9. Frisk, A. R. Werkö, L., Holmgren, A., and Ström, G.: Stockholm's City Health Survey 1954. *Acta med. scandinav., 163:* 1-14, 1959.
10. Helander, E.: Fat Content of Skeletal Muscular Tissue. *Acta morph. neerl. scandinav., 2:* 230-254, 1959.
11. Helander, E.: Muscular Atrophy and Fat Content of Muscle after Unilateral Lumbar Sympathectomy. *Acta Morph. neerl. scandinav., 3:* 48-50, 1960.
12. Helander, E.: Muscular Atrophy and Lipomorphosis Induced by Immobilizing Plaster Casts. *Acta morph. neerl. scandinav., 3:* 92-97, 1960.
13. Malmros, H., and Wigand, G.: The Effect on Serum Cholesterol of Diets Containing Different Fats. *Lancet,* 2: 1-8, 1957.
14. Malmros, H., and Wigand, G.: Atherosclerosis and Deficiency of Essential Fatty Acids. *Lancet, 2:* 749-751, 1959.

BOOK REVIEWS

MANAGEMENT OF THE AGED SURGICAL PATIENT, by Sidney E. Ziffren, The Year Book Publishers, Inc., Chicago, 1960, 219 pages, $7.50.

This volume is directed primarily toward surgeons and attempts to emphasize the aspects of surgical diagnosis and care which are peculiar to the aged. The book is based primarily on the clinical experience of the author and makes only passing reference to the literature. In fact, the references listed in the bibliography are not referred to specifically in the text, and many statements appear in the text for which the appropriate primary reference is missing from the bibliography. Gerontologists will be primarily interested in the appendix which gives mortality rates following 46 different operations in patients grouped in age decades 60-69, 70-79, and over 80. A mortality rate of only 3.5% is reported in 2,561 transrethral prostatic resections. Unfortunately, the author does not record the length of time that the patient was followed after the operation in order for the surgery to be classified as successful.

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THE LOW SODIUM, FAT-CONTROLLED COOKBOOK, by ALMA SMITH PAYNE AND DOROTHY CALLAHAN, with an introduction by Francis L. Chamberlain. Little, Brown and Co. Boston, 1960, 465 pages, $4.75, Special Sunkist edition (paperback), $1.50.

In his introduction F. Chamberlain mentions the conditions which require a low sodium diet and a fat-controlled diet. He inquires who should be advised to change dietary fats in light of our as yet incomplete knowledge and gives the reply: "I believe any one with known coronary or other arterial atherosclerosis in himself or his immediate family, whose blood cholesterol level exceeds 200. Furthermore, I advise all other individuals to keep their blood cholesterol level below 225 as a prophylactic measure, appreciating that this arbitrary level will probably be revised downward after a longer "test of time."

The book gives in several chapters a description of menus and dishes with low sodium content and with adaptions for a low saturated, high unsaturated fat diet. The sodium, unsaturated and saturated fats, and caloric content of 800 items (in household measurements) plus the latest information on usable commercial products are given.

This cookbook will be a very useful guide to physicians, dietitians, and patients and can be highly recommended.

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De Gamles By
Copenhagen, Denmark

STRIKE BACK AT ARTHRITIS, Public Health Service Publication No. 747, Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., 1960, 45 pages, paper bound, 40 cents.

This illustrated pamphlet, published by the U. S. Department of Health, Education, and Welfare, in collaboration with the Arthritis and Rheumatism Foundation, is a companion piece to a previous booklet, Strike Back at Stroke. The consultants are prominent in the field of physical medicine and rehabilitation. The type is large and clear. The main body of the pamphlet consists of demonstrations of home exercises designed to preserve joint range and muscle strength. Some of these are exercises the patient can do alone, whereas others are designed to instruct members of the family in helping carry out these exercises. There is a final section on splinting, shoe wear, crutches, and self-help devices.

This is an altogether admirable booklet. Unfortunately it is not the type that appeals to the sort of person—all to frequent in our population—who prefers to believe in a fairyland of magic cure and to purchase worthless nostrums and fake devices.

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GERIATRIC NURSING, third edition, by Kathleen Newton, C. V. Mosby Company, St. Louis, 483 pages, $6.50.

The purpose of this book is to instruct the students as well as the graduate nurse in the care of old people, either in the home or the hospital.

The book has been divided into two main sections, each of which includes some units, which again are divided into chapters. The first three units of the book, comprising 10 chapters, deal with more common considerations, while the last unit, with 14 chapters, deals with clinical nursing in relation to different groups of diseases.

I. COMMON DIRECTIONS FOR THE CARE OF OLD PEOPLE

The ordinary problems of old people, their feelings, and their social position are examined in order to define the special care they need.

The nurse should regard the elderly patient as an ordinary person who merely has lived for many years and should try to place herself in his position. Patients' reactions toward the various aspects of life are outlined, and the qualifications of the nurse who is going to associate with old people are emphasized. Patience and the ability to tirelessly repeat optimistic instructions and training are necessary qualifications. Since the response of old people is reduced, careful observation of their reactions is necessary. Plans for care must be sound and changes rarely undertaken.

Rehabilitation arrangements, often on a long-term basis, are mentioned, taking into consideration both somatic and psychological defects. If possible, suitable entertainment, using the help of other persons, especially relatives, should be planned. Old people ought not to feel forgotten or neglected.

Public and private sources of help about which the elderly are possibly unaware should be called to their

attention and applied. Suitable employment is very useful. The desirability of old people remaining under home-like surroundings even during illness which does not necessarily require treatment in a hospital is emphasized. The eventual necessity of admission to an institution for chronically ill persons or a nursing home and the proper structure of these institutions are discussed.

Ordinary hygienic care, such as cleanliness, sufficient sleep and food, convenience in dressing, and mental hygience are evaluated. Necessary arrangements for the establishment of suitable treatment of both obese and undernourished patients are pointed out.

II. *Clinical Nursing*

The balance of the book considers the care and nursing of old patients. Every disease group is reviewed in a chapter of its own; thus it will be easy to use the book as a reference in nearly every case of illness. Even pre- and post-operative care and supervision during anesthesia are included.

It is not possible for the reviewer to discuss the chapters in this section in detail, but in summary I would like to state that the book will be very useful for every nurse assigned to the care of old people.

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BOOKS RECEIVED

Aging . . . Some Social and Biological Aspects, Nathan W. Shock, editor. American Association for the Advancement of Science, Washington, D. C., 1960, 436 pages, $8.50 ($7.50 for AAAS members).

The Biology of Aging, Bernard L. Strehler, editor. American Institute of Biological Sciences, Washington, D. C., 1960, 364 pages, $7.75 ($6.75 for AIBS members).

Management of the Aged Surgical Patient, by Sidney E. Ziffren. The Year Book Publishers, Inc., Chicago, 1960, 219 pages, $7.50 (reviewed in this issue, page 40).

Physiology of the Retina and the Visual Pathway, by G. S. Brindley. Edward Arnold Publishers, Ltd., London, 1960, 298 pages, $7.50. The Williams & Williams Co., Baltimore, exclusive U. S. agents.

Transcript of the Workshop on Bone Densitometry, held at the Stone House, National Institutes of Health, Bethesda, December 4, 5, 1959, Stanley M. Garn, Conference Chairman. Fels Research Institute for the Study of Human Development, Yellow Springs, Ohio, 1960, 240 pages, paper bound.

Vision of the Aging Patient, an Optometric Symposium, Monroe J. Hirsch and Ralph E. Wick, editors. Chilton Company, Book Division, Philadelphia, 1960, 328 pages, $7.50.

General Information

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RESEARCH IN PSYCHOLOGICAL AND SOCIAL SCIENCES

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Edited by

Robert J. Havighurst, Ph.D.

Bernice L. Neugarten, Ph.D.

ATTITUDES TOWARD DEATH IN OLDER PERSONS: A SYMPOSIUM

Editor's Foreword

In planning one section of the program of the Fifth Congress of the International Association of Gerontology, held in San Francisco in August, 1960, Dr. Bernice Neugarten and Dr. Jean Treanton arranged a symposium on attitudes toward death in older persons. Reports of empirical studies were invited; and the papers were circulated in advance to discussants who themselves had active research interests in this area.

The symposium was well received, and the Editors have been encouraged to publish the proceedings. We hope, in doing so, to stimulate further investigations in what is as yet a relatively undeveloped area for research in gerontology.

Except for the paper by Mr. Lawrence Corey, which unfortunately has not arrived in time for the printer's deadline, the papers and the discussants' comments appear here in the order of their presentation at the Symposium. To save space, all the authors' references have been combined into a single list.

Robert J. Havighurst, Bernice L. Neugarten
Editors

Age, Personality, and Health Correlates of Death Concerns in Normal Aged Individuals*

PAUL J. RHUDICK, Ph.D.† AND ANDREW S. DIBNER, Ph.D.†
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While the contemplation of one's death may be almost a universal concern, this area of psychology has received relatively little attention in terms of experimental study. There have been a number of speculations about the psychological processes involved, ranging from Freud's notions of the relationship of death concerns to castration anxiety and repetition-compulsion, to theological systems which advocate transcendentalistic explanations. The status of investigations in this area has led Gardner Murphy (Feifel, 1959) to conclude, "I have also been impressed . . . with the cultural contradictions that lie even in the deepest scientific thinking about the whole matter."

Although there has been a paucity of systematic studies, some investigators have attempted to delineate the factors involved in concerns, awareness, and fears of death; frequently, however, reaching contradictory conclusions because of differing research methods. For example, in a developmental context, Wahl (1958) observed that Thanatophobia (fear of death) occurs as early as the third year of life. This finding may be somewhat exceptional inasmuch as Nagy (1948) suggested that genuine acceptance of death does not occur until ages 9 or 10, or about the time the child develops his sense of causality and morality.

Feifel (1955) compared attitudes toward death of mentally ill patients and normal individuals and found that the degree of mental disturbance exerted little effect on thoughts about death. In another investigation, the same author (Feifel, 1959) reported that religious persons fear death more than nonreligious ones. However, Alexander and Adlerstein (1959) suggested, in their experimental study, that death anxiety was aroused more rapidly and with less direct stimuli in nonreligious persons.

While the status of death attitudes is at best ambiguous in respect to the general population, there are even fewer systematic studies using gerontic populations. Does death concern increase in the later years? Is is related to the losses—interpersonal, vocational, or physical—which occur with advanced age? Or is death concern to be considered a reflection of basic anxiety, present throughout life, and therefore,

* This investigation was supported by a research grant (M-1833) from the National Institute of Mental Health, Public Health Service.
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if present in the older person, to be seen more as a neurotic manifestation than as a result of events or processes accompanying aging? Swenson (1958), in a comprehensive investigation of death attitudes in an aged sample, found no relationship between age or sex of respondent and particular attitude toward death. His positive findings revolved around health factors, education and religion. On the basis of his measuring techniques he found, in general, that death attitudes of a fearful or negative nature were not admitted by his gerontological sample.

It is apparent that research on the psychological factors in attitudes about death has not yet produced clear-cut findings. This is partly due to the fact that questionnaire techniques have primarily been employed. Both Swenson and Feifel admit that their results refer only to the conscious, "public" layers of personality structure. The observation by Swenson that fear of death in aged persons is virtually nonexistent may in large part reflect attitudes of denial in his sample. There is reason to believe that fear of death may well exist in an aged sample but is either not readily admitted to consciousness or not easily admitted through questionnaire responses. In any case, there is clearly a need for systematic explorations in this area, especially in the field of gerontology, for as Feifel (1959) pointed out, the adaptation of the older person to dying and death may be a crucial aspect in the aging process. A systematic study of death concerns must use techniques which are not likely to be nullified by ego-defensive maneuvers in eliciting death-relevant material.

THE PROBLEM

The aim of the present study is to investigate the relationship of death concerns in a normal aged group to various sociological, psychological and health variables.

The specific hypotheses of this study are as follows: 1) death concerns in an aged sample are related to personality factors rather than to demographic factors such as age, sex, marital status, and occupational status, in that high death concern in older persons is associated with neurotic tendencies; and 2) death concerns in an aged sample are related to attitudes about health, in that older persons who are concerned about death are concerned about their own health.

SUBJECTS

The sample was taken from the research population of the Age Center of New England which is located in Boston, Mass. The 58 subjects can be described as healthy, well-motivated individuals who live independently in the community and who serve as voluntary participants in various research projects. The group includes both sexes, married and unmarried, working and non-working. Table 1 presents characteristics of the sample in terms of age and education. In this group there are 30 females and 28 males. Twenty of the subjects are married and 38 are unmarried, widowed, or divorced. Thirteen members are currently employed, while 45 are retired.

METHOD

Each subject completed the Minnesota Multiphasic Personality Inventory (MMPI) and the Cornell Medical Index (CMI) as a part of a "core program" of data collection at the Age Center of New England. These two questionnaires were used to assess personality factors and attitudes toward health.

Inasmuch as some investigators have alluded to the strong tendency of denial of death in questionnaire situations, the Thematic Apperception Test (TAT) was used to minimize the possibility of such defensive behavior. In this projective test the subject is presented with a series of moderately ambiguous picture cards and is asked to make up a story about each picture. The rationale for use of fantasy productions is that the more unconscious, not readily reportable aspects of personality can be more easily expressed in story constructions than in answers to direct questions.

Twelve standard cards from the TAT were administered in the manner recommended by Murray (1943). Both sexes received cards 1, 2, 3BM, 6GF, 4, 10, 13MF and 15. In addition, the females were shown cards 7GF, 12F and 18GF; while the males were given cards 7BM,

TABLE 1. AGE AND EDUCATION OF THE SAMPLE.

Group	*N*	Age (in years)		Education (in years)	
		Range	Mean	Range	Mean
I	20	60–69	65.9	9–20	13.7
II	28	70–79	74.8	5–20	13.4
III	10	80–86	82.6	6–18	13.0
Total	58	60–86	73.1	5–20	13.4

8BM and 12M. Inasmuch as statistical analysis revealed that there were no significant differences in death concerns reported between males and females as a result of the three additional cards for each sex, the findings reported in this study are based on analyses of all twelve TAT cards responded to by each subject.

In this study death concern operationally refers to the introduction of a death in the story-response to a TAT card. The reasoning is that mention of death as an integral part of the story production has some personal relevance to the respondent, and may serve as the basis for a measure of his death concern. Two judges agreed 90% in scoring for death content in a story, indicating the reliability of this measure.

It had been noted in a pilot study on a similar sample at the Age Center, that certain cards frequently elicited death stories while others seldom did. It was therefore reasoned that mention of death in response to a card in which death is rarely associated must mean a greater concern with this topic than is the case where death is mentioned in response to a death-relevant card, and should be weighted accordingly. Utilizing the pilot data on 47 cases, it was determined that on cards 15, 3BM, 8BM, 13MF and 18GF death was a frequent theme or outcome. Cards 4, 6BM, 10, 12M and 12F elicited considerably fewer death references, while cards 1, 2, 6GF, 7BM and 7GF rarely prompted such responses. Accordingly a three-point scale was derived in which a rating of "1" was recorded if death was introduced on one of the first-named group of cards; and "2" and "3" respectively for the second and third groups.

The total score for a subject was simply the numerical sum of the weighted death references totaled for all twelve cards. On this basis, the lowest possible score was "0" and the maximum score was "24."

All TAT stories were rated without knowledge of the age, marital status, or occupational status of the subject. The only variable known to the rater was the sex of the respondent.

While measurement of the amount of death concern was the principal aim of the research, an additional judgment was made to indicate the extent of appearance of three types of affects in the TAT stories, viz., anxiety, guilt, and depression. These measures were rated simply on a two-point scale. A rating of one was recorded if the affect was mentioned; zero if it was not. The criteria used by the raters to evaluate these affect states were the commonly accepted manifest clinical indices used in clinical evalution of TAT protocols. Correlations between two raters in scoring for affects were .81 for Anxiety, .79 for Guilt, and .77 for Depression, all of which are statistically significant. Two scores on each affect dimension were determined for each individual, one of the sum of affects across all cards presented to a subject, and the second the sum of affects only on those cards to which the subject responded with a story involving death. The first score is thus an indication of the general intensity of each affect for the individual, and the second score indicates which affect is associated with death concern for him.

RESULTS

Table 2 presents characteristics of the distribution of death-concern scores for the three age groups. For the purpose of comparison of the death scores with other variables, the Median Death Score of "4" was used to separate the subjects into groups of high and low death concern.

Personality factors

The hypothesis relating to the importance of personality factors in relation to death concern was tested by comparing scores on certain selected scales of the MMPI with death concern scores by means of the chi-square test. The results appear in Table 3 and may be summarized as follows: 1) higher death concerns were exhibited by those subjects who also scored significantly higher on these MMPI dimensions: Hypochrondriasis, Hysteria, Dependency, and Impulsivity; 2) a suggestive but not significant relationship appeared between high death concern and high score on the depression scale; and 3) no significant relationships appeared between death concern and any of the other MMPI scales. Thus high death concern seems to be related to certain neurotic tendencies, but unrelated to the tested demographic variables.

TABLE 2. DISTRIBUTION OF DEATH CONCERN SCORES.

Group	Range	Death Score M	Median
I	1–10	4.9	4
II	1–12	4.2	4
III	1–8	3.6	4
Total	1–12	4.4	4

Health attitudes

In order to test the hypothesis relating death concern to health attitude, the death concern scores were compared with CMI scores by means of the chi-square test. The scores on the CMI were the number of "yeses" checked in each section. For sections A-L the median was 12; for sections M-R the median was 3; and for all sections, the median was 19. (The median was used to differentiate high and low scorers.) Results showed that: 1) those individuals who report a multitude of physical symptoms (CMI sections A-L) exhibit significantly more death concern than those who admit to fewer somatic complaints; 2) those subjects who list more psychiatric complaints (CMI sections M-R) manifest more death concerns than those who check few or no psychiatric symptoms; 3) those subjects who admit both to more physical and psychological disturbance show higher death concerns significantly more than those who list fewer such health complaints.

TABLE 3. RELATIONSHIP OF DEATH CONCERN TO MMPI PERSONALITY MEASURES, HEALTH ATTITUDES AND AFFECT STATES.

Variable	N[a]	Significance Level of Chi Square Tests[b]
Demographic Factors:		
Age	58	N.S.
Sex	58	N.S.
Occupational Status	58	N.S.
Marital Status	58	N.S.
Education	58	N.S.
Personality Factors (MMPI):		
Hypochondriasis	47	P<.01
Depression	52	P<.10>.05
Hysteria	52	P<.05
Psychasthenia	52	N.S.
Paranoia	48	N.S.
Schizophrenia	47	N.S.
Hypomania	47	N.S.
Ego Strength (Barron)	47	N.S.
Social Introversion	47	N.S.
Anxiety (Welsh)	47	N.S.
Repression—Denial (Gough)	47	N.S.
Dependency (Navran)	47	P<.05
Impulsivity (Gough)	47	P<.05
Neuroticism (Winne)	47	N.S.
Health Attitudes (CMI):		
Sections A-L (Physical)	58	<.005
Sections M-R (Psychiatric)	58	<.05
All Sections (Physical and Psychiatric)	58	<.025
Affect States:		
Anxiety	58	N.S.
Guilt	58	N.S.
Depression	58	<.05

[a] Not all subjects received all the MMPI scales because the population at the time of study was utilized simultaneously for other research projects which precluded administration of all the scales.

[b] One-tailed.

Affect states

Ratings of affects across all cards for a subject (general affect-tendencies) were compared with affect ratings on only those cards in which the subject mentioned death. These sets of ratings were almost perfectly positively correlated. There were no statistically significant differences as to the kinds of affects that accompanied the TAT productions, whether or not a death was mentioned.

The type of affective state most frequently appearing was depression. Guilt and anxiety occurred approximately equally, and about half as frequently, on the average, as depression in that order. These proportions remained constant for the different age groups and for the two sexes.

Tests were then made of the relationship between death concern and affect. The findings are shown in Table 3. Concern about death in these older persons seems to be accompanied by depressive affect rather than by anxiety or guilt.

DISCUSSION

These findings tend to corroborate some of those of Swenson (1958) who reported no demonstrable relationship between type of death attitude and sex, age, and occupational status. On the other hand, the results of this study suggest some relationships to certain MMPI scales which Swenson's investigation did not. Further, while Swenson suggested that more educated aged individuals face death more readily than the less educated, this research reveals no significant differences in respect to education.

Some of the inconsistencies may be resolved by reference to the difference in measuring techniques. Swenson relied on responses to questionnaire items while this study used ambiguous projective stimuli, i.e., TAT cards. The subjects in this study were uninformed as to the particular area being studied, while Swenson's subjects were confronted with direct questions about death. Certainly some defensive behavior can be expected in the latter situation.

The lack of demonstrable relationships between death concerns as operationally defined in this study and certain demographic variables requires comment. It might have been predicted, for instance, that females would express more death concern because they tend to be more expressive in fantasy than males (Lind-

zey & Goldberg, 1953). While this observation may apply to certain areas which carry special social restrictions for the females, e.g., sex, it apparently does not include the concerns over death.

When the findings in relation to personality variables are examined more closely, several important suggestions emerge. The high scorers on the dimensions of Hypochondriasis (Hs), Hysteria (Hy), Dependency (Dp), and Impulsivity (Im) demonstrated significantly more death concerns than low scorers. At the same time, there were no significant relationships between death concern and the measures of hypomania, paranoia, schizophrenia, anxiety, and psychasthenia. The implication is that the profile of those subjects with high death concerns tends more to be like the neurotic than the psychotic. As May (1950) stated, "It may be that whenever concern about death arises, it is best to work first on the assumption that neurotic elements may be present. . . ."

The type of neurotic constellation suggested by these findings is that of preoccupation and withdrawal into body symptoms, dependence, affective lability, and depression. The lack of relationship of high death concern to anxiety and psychasthenia suggests that those who have pre-conscious death concern do not have anxiety of the free-floating or obsessive variety; rather, the anxiety tends to be attached to bodily symptoms. This statement seems to be partly corroborated by the finding on the CMI data, i.e., the more frequent the reporting of physical symptoms, the higher the death concern. It is important to note that the CMI elicits attitude toward health, not necessarily the actual physical status of the respondent. The strongest relationships are suggested by the subjects who admit to many physical symptoms on the CMI and also score high on the Hypochondriasis scale of the MMPI.

The finding that those persons who report more psychiatric symptoms on the CMI evidence more death concern than those who check fewer symptoms, tends to be consistent with the neurotic pattern exhibited on the MMPI scales.

The examination of the data in relation to type of affect introduced tended to substantiate some previously reported work (Busse, 1955). The most prominent affect, of the three measured, both in cards which had death as an outcome and in those which did not, was that of depression. The fact that anxiety occurred less frequently than depression points to several possibilities: 1) it corroborates, at the projective level, the relative lack of anxiety exhibited on the MMPI; 2) it indicates that death concerns do not necessarily mean the arousal of anxiety; rather, concern over it is accompanied by some somatizing and withdrawal tendencies.

The findings suggested no variation with age in predominant kind of affect. In part this may be due to the simplicity of the measuring device, for Busse (1955) observed in his elderly subjects reported changes with age in the frequency and depth of depressive feelings.

The findings of this study are based on intragroup differences among a normal, apparently healthy, aged population. The amount and type of death concern can be inferred only from these comparisons. Further research should include a younger sample to test age differences in a longer time context than afforded by this study, perhaps aiming at some kind of developmental explanation. In addition, institutionalized aged samples might be studied because such a population could be expected to manifest different attitudes toward death, perhaps as a response to their institutional setting or as a reaction to more pathological health states. Finally, both young and old persons who are in the actual process of dying from terminal-type diseases might serve as a focus of study to assess the handling of death concerns as it is influenced by knowledge of impending death. Ideally, a study with strict controls for age, health, and mental status is needed to ferret out the kinds of complex interactive factors that contribute to death concern.

One comment, regarding the measuring technique used in this study: admittedly the TAT is a complex vehicle for expression of certain fantasy states. The scoring scheme used here, though leading to some quantifiable results, can be further refined and elaborated. For example, the circumstances under which the fantasied deaths occur in the TAT stories can be categorized; also, the death-responses on the TAT can be studied in relation to autobiographical material such as actual experiences with death of loved ones. Both of these are logical next steps in the examination of factors that influence death concern.

SUMMARY

This study focused on certain anticipated correlates of death concerns among a sample of 58 normal aging individuals. Twelve TAT cards were used to elicit death concerns, and two questionnaires, the MMPI and CMI, were used to measure personality characteristics and health attitudes.

As predicted, there was no relationship of high death concern to such demographic variables as age, sex, occupational status (retired or working), marital status or education; but high death concern was associated with high scores on the MMPI dimensions of Hypochondriasis, Hysteria, Dependency and Impulsivity. This finding was interpreted to mean that concern over death involves neurotic preoccupation, particularly in relation to bodily symptoms. The interpretation tended to be confirmed by the relationship of high death concern to high scores on both the physical and psychiatric disturbance sections on the CMI.

Attitudes Toward Death in an Aged Population

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What are some of the characteristics of the "death contemplation"? Is it a construct that exists in all persons? If so, with what does it vary or to what does it relate? In what manner do old people deal with the problem of death? As they grow less and less productive in our society, do they have less and less of a desire to live? The present investigation attempts to answer in part some of these provocative questions.

A search of the literature for psychologically oriented investigations of the death-attitude construct yields few reports, in spite of the fact that the published studies cover a span of more than 60 years.

In 1896, Scott published a paper entitled "Old Age and Death." Of 16 persons whose mean age was 76 years, 94 per cent said they would not care to live their lives over again. Seventy per cent "longed to die," and 14 per cent felt that life was "not worth living now." Scott concluded that most of the "dwelling upon death" takes place during adolescence.

Chandler (1950) later revised and brought up to date Scott and Hall's original questionnaire on death. In answer to the question, "Do you worry about dying or the hereafter more or less than formerly?" Chandler found that the great majority of the 950 professional men questioned denied entertaining any increased worry.

Klopfer (1947) studied attitudes towards death by analysing responses to ten Thematic Apperception Test (TAT) cards, and concluded that fear of death among people in a home for the aged was significantly lessened when greater activity was possible for such persons.

Shrut (1955) studied attitudes toward death in older Hebrew women by means of clinical impressions of responses to the TAT and a Sentence Completion Test. He found that "subjects residing in an environment more closely approximating their pre-institutional homes or domestic environment (apartment residence) revealed lesser fear of death. . . ."

More recently, Feifel (1956) interviewed 40 white male veterans of World War I who were either physically ill or otherwise unable to support themselves. He concluded that these men had two dominant outlooks: one group visualized death as the dissolution of bodily life and the doorway to a new life, and the other group looked at death with a "philosophic resignation," as "the end."

A recently published book (1959) edited by the same author yields no further studies specifically designed for the objective evaluation of attitudes toward death in elderly people. Feifel's own chapter in this book elaborates to some degree the study just mentioned.

THE SAMPLE

In the present investigation 210 persons were studied, all 60 years of age or more and all residents of Minnesota. They were contacted through homes for the aged, Golden Age Clubs, and organizations and industries scattered throughout the state that employ persons more than 60 years old.

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It is estimated that approximately 65 per cent of the attending members of the Golden Age Clubs with whom contact was established cooperated in some part of the study, and that approximately 40 per cent of the persons reached in rest homes cooperated. Although the point is more difficult to determine because of the method by which contact was made, approximately 75 per cent of the employed persons solicited cooperated in the study.

The sample consisted of 152 females and 58 males. Table 1 gives specific description of the sample in respect to age, education, work status, marital status, urban-rural residence and religious activity. Certain sampling biases are obvious. The group is heavily loaded with females and there is a preponderance of Protestants in the group. A large majority of the group come from urban surroundings. There may be other more subtle biases, but they are not explicit in the data.

THE METHOD

Two separate methods of evaluating attitudes toward death were used. The first was a check list of death attitudes. Written essays describing attitudes toward death were obtained from 34 persons (not included in the final study) 50 years old or more. These essays were methodically examined by the investigator; and a check list was devised containing 35 descriptive statements as reproduced below:

Check List of Death Attitudes.

We all think about death at some time or other. Below are a number of words or phrases that can be used in some way to describe *your* attitudes or feelings as you think of death. Go through the list quickly and put a mark (X) in front of any word or phrase that describes your *present* feelings about death. Don't spend too much time on any one, but be sure to check all those which describe your feelings. You can help most by being as frank and as truthful as you can. Remember, your name doesn't appear anywhere on these sheets.

1. Happiness.
B* 2. Don't think about it.
A 3. Glorious happy life.
4. Pleasant.
5. Sadness.
6. The end of everything.
7. Fear leaving loved ones.
A 8. It will be wonderful.
A 9. All troubles will be over.
10. Something you face every day.
11. Promise of new and better life.
12. Terror overcomes me.
13. Very difficult to accept it.
A 14. Most beautiful experience of all.
B 15. I don't think about death.
16. Everyone's time is set.
17. I fear death.
B 18. Don't dwell on it at my age.
A 19. I look forward to death.
A 20. Peaceful bliss.
21. Many more "living" things to think about.
A 22. Enter into true Paradise.
23. Think of Hell's torments.
B 24. Don't waste time thinking about it.
B 25. Feel fine and no reason to think about it.
26. It disturbs me a great deal.
A 27. It gladdens my heart.
28. Have nothing to do with the subject.
29. Deliverance from all this pain and difficulty.
30. All God's wonderful promises will come true.
31. No doubt a grim experience.
B 32. Still a long way off.
33. Death is as sure as taxes.
34. Dread the thought of it.
35. All that I read in the Bible will come true.

* The 8 items marked A constitute cluster A; the 6 marked B constitute cluster B.

A second measuring instrument was a forced-choice rating scale on which the subject summarized his attitudes toward death as follows:

1. A wonderful experience to look forward to.
2. Look forward to it.
3. Just don't think about it.
4. Think of it with some fear.
5. Very fearful of it.
6. None of these fit my feelings.

There was also developed a 22-item check list on interests, hobbies and activities. The recipients were asked to check any of the hobbies or activities in which they had taken part during the previous year and to check whether they engaged in these activities "often" or "sometimes." Some examples are: Senior Citizens' Clubs; sewing, knitting or other fancywork; listening to music; traveling; gardening or flower raising; and card playing, checkers or chess.

The Minnesota Multiphasic Personality Inventory (MMPI) (Hathaway & McKinley, 1945) was employed primarily to obtain: 1) a measure of devotion to religion as defined by a "religiosity scale" previously developed by Cottrell (this scale measured primarily the fundamentalist type of religious attitude with items such as "I believe in a life hereafter," "I go to church almost once a week," "I read the Bible several times a week"), and 2) a measure of latitude of interest by means of use of the "interest items" in the MMPI item pool. Of the 210 persons, 95 cooperated in completing the MMPI and provided valid profiles.

RESULTS

Determination of clusters of items on the death-attitude check list was done on an empirical basis. Tabulation of the frequency of checks for each of the items and for each of the respondents was made. The relationship or overlap between any two items in the check list was determined. A ratio was calculated between the expected and the actual frequencies of each pair of items. A table of these ratios was used for obtaining a basis of related items. When the relationship of these item pairs was compared, two distinct clusters evolved. The 8 items forming cluster A (items, 3, 8, 9, 14, 19, 20, 22, and 27) seem to describe a positive or forward-looking attitude toward death, whereas the 6 items in cluster B (items 2, 15, 18, 24, 25, and 32) form what might be labeled an "actively evasive" attitude toward death.

Each of the 210 persons was given a score on cluster A and on cluster B. The group was then divided into three subgroups:

Group A. High in cluster A and low in cluster B (82 persons).

Group B. Low in cluster A and high in cluster B (71 persons).

Group C. Either zero or equal score in both clusters (57 persons).

Group C could be best described as persons who were either very indecisive about their attitudes toward death or "passively evasive" about them. It is notable that the cluster analysis yielded no significant "fearful of death" cluster.

The rating scale of attitudes toward death yielded four groups of subjects:

Group	*Label*	*No.*
1. Item 1 or 2	Positive	96
2. Item 3	Active-evasive	55
3. Item 4 or 5	Negative	21
4. Item 6 or no response	Passive-evasive	38

This rating scale of attitudes toward death elicited a "fearful of death" response from only 10 per cent of the respondents.

The results from both the check list and the rating scale were checked against all the variables listed in Table 1. Results are based upon the construction of a series of contingency tables from which chi square was derived to determine the statistical significance of the relationships. These chi-square calculations appear in Table 2.

A summary of some of the significant findings shown in Table 2 is as follows:

1. Both a check list and a rating scale can be used to measure attitudes toward death in older persons.

2. The check list shows significant relationships with other variables more than twice as frequently as does the rating scale, suggesting the greater sensitivity of the check list.

3. There is a significant relationship between religiosity and attitudes toward death as measured by both religious activity and the MMPI rel scale. Persons with more fundamental religious convictions and habits look forward to death more than do those with less fundamental convictions and less activity. Fearful attitudes toward death tend to be found in those persons with little religious activity.

TABLE 1. THE SAMPLE.

Chief characteristics	Male ($N=58$)	Female ($N=152$)
Age:		
60–69	17	49
70–79	24	62
80+	17	41
Education:		
Grade School	25	70
High School	15	49
College	17	32
Not stated	1	1
Work status:		
Working full time	15	16
Working part time	6	12
Retired, no work	28	61
Physically unable to work	7	40
Housekeeping for husband	0	22
Not stated	2	1
Marital status:		
Single	3	26
Separated	3	9
Married	31	25
Widowed	20	91
Not stated	1	1
Urban or nonurban:		
Urban	42	108
Nonurban	15	42
Not stated	1	2
Religious activity (Protestant, 75%; Catholic, 10%; no religious affiliation, 15%):		
Regular	38	108
Some activity	18	38
No activity	1	4
Not stated	1	2

4. There is a significant relationship between home living conditions and attitudes toward death. Persons residing in homes for the aged have a more positive, forward-looking attitude than do those who live alone, these latter persons tending to evade actively issues related to death. Fear of death is found more often in those living alone than in those living with relatives or in homes for the aged.

5. There is a tendency for less educated persons to be evasive in regard to their attitudes toward death, whereas persons who have finished college express themselves more specifically—either looking forward to the experience positively or fearing it.

6. Three other characteristics show less clear, but still suggestive, relationships with attitudes toward death:

a. Marital status. Widowed persons passively evade the issue of death, whereas single, separated, and married persons tend to look forward to death.

b. Latitude of interest. Persons indicating that they have a large number of outside interests tend to be actively evasive concerning the subject of death, and those who report only a few activities refuse to commit themselves at all (passive-evasive) on the matter.

c. Health. Persons who reported good health were most often actively evasive in considering death. Those reporting poor health most often looked forward to death in a positive manner.

7. None of the other characteristics listed—age, sex, source of income, occupational status or urban-rural location—manifested any significant relationship with attitudes toward death.

TABLE 2. RELATIONSHIPS BETWEEN ATTITUDES TOWARD DEATH AND VARIOUS PHYSICAL AND SOCIAL CHARACTERISTICS.

Characteristic	Instrument	χ^2	p
Religious activity	rating	18.06	.01
Religious activity	check list	13.67	.01
MMPI rel score	check list	16.74	.01
Home living conditions	check list	15.23	.01
Level of education	rating	16.80	.01
Home living conditions	rating	14.95	.02
Marital status	check list	10.53	.04
MMPI interest score	check list	10.70	.04
Self-concept of health	check list	10.32	.04
Sex	check list	5.80	.06
MMPI rel score	rating	11.65	.07
Number of hobbies and activity	check list	8.71	.08
Level of education	check list	7.36	.11
Age	rating	9.96	.13
Source of income	check list	5.88	.19
MMPI interest score	rating	8.20	.23
Source of income	rating	10.22	.32
Sex	rating	3.34	.35
Marital status	rating	6.19	.40
Occupational status	rating	5.61	.50
Number of hobbies and activity	rating	4.68	.60
Age	check list	2.60	.60
Occupational status	check list	2.60	.75
Urban vs. nonurban	check list	0.07	.79
Urban vs. nonurban	rating	0.67	.88
Self-concept of health	rating	2.27	.90

COMMENT

Within the framework of the specific observations just enumerated, a number of conclusions seem justified.

It is apparent that attitudes toward death can be measured by a structured psychometric device. Projective technics apparently are not the only tools that can be used to elicit specific information about contemplation of death.

It is apparent that the aged person does not often admit to a fear of death. In fact, either he looks forward to death or tends to be evasive in his contemplation of the experience of death. Investigators postulating a relatively common "fear of death" in the persons they study probably have resorted to subjective or indirect inferences.

Religion apparently plays a very significant role in the aged person's attitude toward death. Since a large percentage of persons interrogated in this investigation identified themselves with some form of the Christian religion, it seems logical to infer that the eschatologically oriented person contemplates death in a positive manner.

People in homes for the aged look forward to death much more than do those living outside of institutions. The data suggested that solitary existence in old age is somewhat associated with a fearful contemplation of the experience of death.

The relationship between education and attitudes toward death is difficult to interpret. It is possible to infer that the experience of death is a very complex one to contemplate and that therefore it is directly considered (either with fear or with a forward-looking attitude) only by those persons of above-average intelligence.

Certainly, additional objective investigations conducted with the use of structured personality devices are indicated.

Attitudes of Older Persons Toward Death: A Preliminary Study*

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Scheler (1953) has said that death is viewed by mankind merely as the end point of aging. It may be hypothesized, however, that attitudes toward death may have a direct effect upon adjustment and upon attitudes toward life. The first step in research undertaken to test this hypothesis will necessarily be an exploration of methods to determine attitudes toward death; the second, an attempt to see what these attitudes may be; and the third, an investigation of the other factors to which these attitudes may be related.

A few earlier studies bear upon these points. Feifel (1956, 1959), for instance, studied white male veterans living at a VA Domiciliary. When asked, "What does death mean to you?" 40 per cent expressed religious belief, with a new life expected after death; 10 per cent thought death would mean relief and a peaceful sleep; 10 per cent did not know. When asked, "What do you think happens to us after we die?" 25 per cent said, "When you're dead, you're dead"; 60 per cent had some religious orientation, with hope of a hereafter (15 per cent of those who thought death was the end now asserted a belief in some kind of hereafter); 10 per cent still did not know; and 5 per cent thought it would mean a long sound sleep.

In another study (1956) on what age groups least and most fear death, 45 per cent of Feifel's same older subjects thought that people most feared death in the 70's and beyond, "because you're close to it then; you're at the end of your rope"; 15 per cent thought the period at which death was most feared was in the 40's, and 15 per cent saw it as in the 20's. On the other hand, old age was singled out by 35 per cent of the older subjects as the time most people *least* fear death because, "You accept and are resigned to it; you've lived your life." The inference was that certain people fear idleness and uselessness in old age more than they do death.

Feifel found that there was a religious outlook evident in those 48 per cent who "occasionally" and those 20 per cent who "frequently" thought about death as distinguished from the 32 per cent who "rarely" thought about it. He also reported that older persons who are religiously inclined give more thought to concepts about death than do those to whom death represents the inexorable end. Do the former master their anxiety about death by thinking of it as a precursor of a new life? It was interesting that 77 per cent of this older age group viewed old age as "the end of the line," with only 15 per cent seeing it as a time of leisure and contentment. In conclusion, Feifel pointed out that his data pertain to conscious and public attitudes of his respondees more than to the deeper layers of the personality.

Shrutt (1958) compared attitudes toward death of a group of 30 ambulatory aged white female residents in the apartment section of the Home for Aged and Infirm Hebrews in New York with those of 30 similar persons who lived in the larger and more institutionalized Central House of the same Home. He used clinical impressions based on a sentence completion test and 10 TAT cards, plus three questionnaires on health, adjustment and participation in activities. He found that the subjects living in the apartments, which were more like their previous living arrangements, showed less fear of or preoccupation with death; which might mean, he said, that they enjoyed better mental health. He reported that both groups of subjects revealed at least mild anxiety with regard to thoughts of death.

Schilder and Bromberg (1933, 1942) studied responses to a series of questions on death given by 70 normal adults of various ages and by mental patients in whom death thoughts were prominent. They concluded that, "There seemed to be no essential difference as far as age of the subject was concerned. . . . It is possible to correlate closely the attitudes toward one's own death with attitudes toward death of other people."

Faunce and Fulton (1958) have reported that "emotional responses suggesting either fear of death or of the dead were more frequent among spiritually oriented than among temporally oriented individuals."

* This investigation was performed with the support of the USPHS grants M 900, M 2109, and H 3582, Dr. E. W. Busse, principal investigator. The authors wish to express their gratitude to Mrs. Dorothy Heyman for her assistance in this study.

THE DATA

As part of a two-day series of examinations involving a variety of disciplines, the biracial group of 260 community volunteers, 60 years of age and older, were asked, during the course of a two-hour social history interview, "Are you afraid to die?" and "Do you believe in a life after death?"

Fear of death

Answers to the first question were distributed as shown in Table 1.

Fear of death was explored in relation to 52 other variables: demographic (race, age, sex, marital status, education); physical (functional rating, cardiac status, symptom count); psychological (taken from three WAIS and four Rorschach ratings); psychiatric (classification, subjective emotional reaction, hypochondriasis); and social (activities, attitudes, self-health rating and concern, religious items, adjustment ratings). Analysis by chi-square yielded the statistically significant associations shown in Table 2.

Since many of the older subjects answered the question, "Are you afraid to die?" in religious terminology, an analysis of these answers yielded associations as follows (χ^2 significant at the .001 level):

1) The *unqualified No* answers were associated with religious terminology.

2) The answers suggesting *ambivalence* were associated with an absence of religious connotations.

3) The answers *admitting fear of death* tended to have no religious connotation.

TABLE 1. PERCENTAGES OF ANSWERS TO "ARE YOU AFRAID TO DIE?" (N=254).

Yes		10
No		35
No, but want to live as long as possible	13	
No, but dread pain of dying	2	
Mixed feelings (balanced ambivalence)	16	
		31
No, but don't want to be sick or dependent a long time	4	
No, but it's inevitable	17	
No, other elaboration	3	
		24
Total		100

It therefore appears that the factors associated with *no* fear of death include a tendency to read the Bible oftener, more belief in a future life, reference to death with more religious connotations, fewer feelings of rejection and depression, higher scores on full scale and performance IQ, and more responses on the Rorschach (with the suggestion also of more leisure activities).

Belief in afterlife

The inquiry on belief in life after death revealed that very few of the subjects denied such a belief outright. Only 2 per cent said "no"; 21 per cent said "not sure"; and 77 per cent said, "yes, sure of it."

Belief in life after death was examined in relation to 37 demographic, physical, psychological, psychiatric and social variables. Statistically significant associations were obtained for 10 of these variables (Table 3).

Religious activities and attitudes appear to be the most important variables associated with belief in life after death, but depression, intelligence, and socioeconomic status are also probably associated.

CLINICAL IMPRESSIONS

The clinical impressions and experience of the present investigators, who have had extensive study and contact with not only the 260 community volunteer subjects in the present group but also with other groups of older persons during the past six years or more, may be useful in interpreting the empirical data.

1) As Schilder (1942) has suggested, there may be no common human idea of death, but it may be an extremely individualized concept. He hypothesized that individual experiences become the determining factors for the picture which one develops of death. Gardner Murphy,

TABLE 2. FEAR OF DEATH IN RELATION TO OTHER VARIABLES.

	χ^2 level of confidence
Fear of death is associated with:	
Less belief in life after death	.01
Less frequent Bible reading	.01
Feelings of rejection and depression	.05
Lower full-scale IQ	.05
Lower performance IQ	.001
Fewer number of Rorschach responses	.02
Fewer leisure activities	.10

in his discussion of the contributions to Feifel's book (1959), concludes that, "It is apparent that fear of death is not psychologically homogeneous at all, even in a narrowly defined cultural group."

2) The technique of direct questioning may be inappropriate for reaching the real feelings of the subject, even though in the present study the questions were asked near the end of a social history taken in an informal setting; and even though the interviewer was previously known to the subject and good rapport had been established. In addition, in all such inquiries, a semantic factor which needs clarification is that of differentiation between the words "death" and "dying."

3) Bearing in mind that the subjects were community volunteers living in their own homes and neighborhoods, and following Shrutt's finding (1958) that those older persons having less institutionalized living arrangements show less fear of or preoccupation with death, it is perhaps to be anticipated that only a small proportion of the present sample should express fear of death.

4) Religion is a very great part of community life in the North Carolina region in which the study was carried out. Only 6 per cent of these older subjects had no church membership. It is accordingly to be expected that most of them would think of death in religious terminology.

5) The distribution of responses to the question, "Are you afraid to die?" (Table 1) confirms the clinical impressions of the Duke geriatrics research group that denial is a very important mechanism for dealing with anxiety in old age. The mental mechanism of denial may be among the most common adaptive techniques employed in personality adjustment by persons beyond the fifth decade of life. Its use may be promoted chiefly by three factors: 1) perceptual distortions (as suggested by Linn, 1953) during the later period of life due to concomitant changes in cortical and receptor processes; 2) changes in body image with age and chronic disease; this parallels the frequent utilization of this same regressive maneuver by younger persons who have devastating chronic diseases; 3) gradual deterioration of the central nervous system, which causes reversal of the mental processes toward those of early childhood, when the denial mechanism of unacceptable reality situations is quite universally utilized.

TABLE 3. BELIEF IN LIFE AFTER DEATH IN RELATION TO OTHER VARIABLES.

	χ^2 level of confidence
Belief in life after death is associated with:	
Less fear of death	.01
More frequent church attendance	.01
More frequent Bible reading	.001
Greater number of religious activities	.001
Stronger religious attitudes	.001
Feeling that religion is the most important thing in life	.001
Less depression (psychiatric rating)	.001
Lower scores on full scale IQ	.02
Lower socioeconomic status	.05
More women than men	.05
Less high level of education	.10

SUGGESTED TECHNIQUES FOR STUDYING ATTITUDES TOWARD DEATH

It is the feeling of the investigators that fear of death and illness plays an important part in the unconscious psychological life of the individual, but it is clearly evident that much further research is needed in this area. Several avenues are suggested for the further study of attitudes of older persons toward death:

Direct questioning has certain advantages, even though, as Feifel (1956) has noted, the answers to direct questions tap the conscious and public attitudes of the subjects rather than the deeper layers of the personality. Direct questioning on the topic of death may prove too threatening to aged or ill persons, and such affects need to be given careful consideration. We have, however, found a willingness on the part of older subjects to speak freely on the topic of death. This confirms the finding of Beard in her study of centenarians (1956) who, she said, have "no morbid fears about death or any special reticence in discussing it."

Clinical depth interviews, preferably repeated through time, would doubtless be the most valuable single method for determining an individual's attitude toward death. Considerations of staff time and of the psychotherapy which might be involved necessarily limit the widespread utilization of this method.

Projective methods such as focussed thematic pictures, sentence completions, and word association tests specifically designed to elicit responses to death and illness are fruitful methods. The sorting of TAT responses, as has been done by Neugarten and her associates (1958), and the utilization of sentence completion data

for assessing attitudes as by Golde and Kogan (1959) and their colleagues provide possible models for dealing with such data.

The work of Osgood *et al.* (1958), Nunnally and Kittross (1958) and more recently that of Altrocchi and Eisdorfer (1960) suggests that semantic differential procedures are useful for assessing attitudes toward such concepts as illness, death, and dependency.

It would also be useful to obtain psychophysiological correlates of the aged person's discussion of concepts involving death. Psychophysiological measurements could be studied either as a measure of the response to focussed projective material or in conjunction with a series of interviews designed to elicit the aged individual's affects and his defensive techniques in dealing with feelings in this area.

Attitudes Toward Death among a Group of Acute Geriatric Psychiatric Patients

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Can one broach the topic of death with a group of debilitated psychiatrically disturbed geriatric patients whose death is imminent? With the increased interest in the study of death (Ficarra, 1960; Guttentag, 1959; Natanson, 1959) and living man's relation to its inevitability, some systematic evaluation of how different population groups (Feifel, 1949) deal with this problem is useful to patients and physicians alike, and a prerequisite to the formulation of a thanatology (Eissler, 1955).

This is a pilot study[1] to determine how a group of geriatric psychiatric patients felt about the topic of death. The data is based on interviews of 100 consecutive patients admitted during the last three months of 1959 to the psychiatric wards of the San Francisco General Hospital. Each patient in this group was 60 years or older, had lived in San Francisco for one or more years prior to his hospitalization, and had not required psychiatric treatment prior to the age of 60.

Of the 100 patients, 62 were questioned and were able to respond about their attitude toward death. The death questions used are as follows:

1. Have you had any friends or relatives who have recently been in the hospital, and what happened to them?
2. How old do you wish to get, and how old do you expect to get?
3. How is your physical health?
4. Have you talked about death with anyone before? If not, why not? If yes, what was said?
5. What is your feeling about death?
6. Have you made any plans for the future? Do you have a will, a burial plot, or any plans following your death? What are they?
7. How do you feel about capital punishment, about mercy killing?
8. If a patient is going to die soon, should the doctor tell him? Would you want to be told? Would you want . . . (nearest relative or friend) to be told if he were going to die soon?
9. If you had the choice of dying tomorrow or being bedridden for the next three years, which would you choose?
10. If you had the choice of dying tomorrow or being in severe pain for a year, but knew you would be O.K. at the end of that time, which would you choose?
11. How did you feel about our talk about death? Do you think doctors in general should talk about death with their patients?

With regard to the other 38 patients, the interviewer was at first fearful that a discussion of death would upset the more severely disoriented, disorganized, or delusional patients. As the study progressed, however, it was found that those patients who could respond at all to the question about death gave meaningful answers. Therefore, more and more seriously disturbed patients were drawn into the sample, until in the last half of the group only the deaf, aphasic or comatose patients were excluded.

[1] The study was made in the course of work with the Studies in Geriatric Mental Illness, a multi-disciplinary undertaking affiliated with the Langley Porter Neuropsychiatric Institute. The studies are under the direction of Dr. Alexander Simon, and are supported by Grant No. 3M-9145 (CISI) from the National Institute of Mental Health. Dr. Lawrence Katz, Associate Research Psychologist with the Geriatric Research Project, has given invaluable aid with the statistical analysis.

None of the patients became so upset consequently that the hospital staff noticed an adverse behavioral change. To obtain more meaningful responses, the death questions were introduced in as personal and unstructured a way as possible during the course of a psychiatric and neurological examination. One third of the patients, however, fell asleep, became delusional, became markedly irritable or angry, became more disoriented, or attempted to leave the interviewer, so that it was necessary to explain the research nature of the death questions before the examination was completed.

While discussing the topic of death with this group of psychiatric patients, the interviewer wanted to gather data on the following four questions: What is the physician's subjective impression of patients' reactions to a discussion of death? Would a more objective test, such as the word association test, substantiate the interviewer's subjective impression? Are there any factors such as age, religion, or schooling, which may be associated with the patient's adjustment to the inevitability of his own death? What is the expressed opinion of these patients on various questions dealing directly and indirectly with death? The findings will be given as answers to these four questions.

FINDINGS

Physician's impressions. The interviewer felt that all but two of the patients were considerably upset about death and used denial, suppression, and repression as defenses. For example, a chronic alcoholic woman, whose husband had suddenly and unexpectedly died five days before her admission, required hospitalization because of severe intoxication. When asked her feelings about her husband's death, she seemed perplexed. She then spoke of the settlement of his estate. Although the interviewer attempted to bring out her feelings about the impact of her husband's death on her future, she could not discuss it. She stated she had not thought or talked about death before this discussion. In contrast, a woman with a large fungating necrotic carcinoma of the breast spoke quite freely and with relief that she was in a situation where she could speak about death. She discussed the pros and cons of having a radical mastectomy, saying she seriously wondered whether she should prolong her life —probably only to live in pain.

Since 55 of the 62 patients were judged to require supervision at least at night because of physical illness or incapacitation (although all had been hospitalized for psychiatric reasons); and because five of the 62 died within a few days of the examination, one can speculate that their psychiatric symptoms might in part have been an outgrowth of this marked conscious denial of death.

Word Association Test. Half the patients were asked to respond to the words:

Food	Family
Sleep	Doctor
Water	To Leave
Sickness	Milk
Hospital	Dying

The interviewer postulated that longer association time to the death words than to the other words is correlated with greater anxiety about death. With these patients the association time to the word "dying" was longer than the association times to the other nine words. (Statistically, using the t test, the difference obtained could occur by chance alone less than five times out of one hundred.)

With the second half of the patients the word "grave" was substituted for "sickness"; and "death" was substituted for "to leave." The average of the association times to the three death words was also longer than the average of the association times to the seven other words. (Again, this difference could occur by chance alone less than five times out of one hundred.) The associations to the death words were often more bizarre and produced more blocking. Also, these words were more often than the other words not heard by the patient. These findings would substantiate the subjective impression of the examiner that these patients were anxious about death.

Background factors. To determine whether there were any factors in the patients' backgrounds that might have decreased their anxiety about death, the patients were first grouped into those who were more and those who were less afraid of death. To do this, four clinicians (two psychiatrists and two clinical psychologists on the teaching staff of the Langley Porter Neuropsychiatric Institute) were asked to rate the death questions as to their validity as a test of fear of death, and a scale was devised, as follows:

FEAR OF DEATH SCALE

1. The patient has some plan following his death, such as a will: yes, rated 0; no, rated 1.
2. During the talk about death the patient made one or more spontaneous statements about death and showed appropriate affect, rated 0. If he made no spontaneous statement or treated the topic blandly, he is rated 1. If he gives one-word answers or shows anger or resentment at being questioned about death he is rated 2. If he becomes abusively angry or markedly suspicious he is rated 3.
3. In the word association test used with the first half of the patients, if the word "dying" was the longest of the ten, rated 2: if it was the second longest word, rated 1; otherwise, rated 0. With the second half of the patients where "death," "dying" and "grave" were used, if the average association time of these three words is longer than the average association time of the other seven words, rated 1. One additional point is given if one of the three death words had the longest association time of all the words. If neither of these is the case, the patient is rated 0.
4. The patient has talked about death or dying before this interview: yes, rated 0; no, rated 1.
5. The patient wants to be told of his own imminent death by a physician: yes, rated 0; no, rated 1.
6. The patient would want his relative or friend told if the relative (friend) were terminally ill: yes, rated 0; no, rated 1.
7. The patient is asked, "How is your physical health?" If he says good, and his health is judged by a physician as "can live alone or needs assistance only at night for physical reasons," rated 0. If he says good, but is judged by a physician as needing almost full time assistance for physical reasons, rated 1. If he says good, but is judged by a physician as needing full time assistance for physical reasons, rated 2.

Scores were computed for 60 patients; and the group was then divided into those with "less fear of death" ($N = 26$) and those with "more fear of death" ($N = 34$).

A series of contingency tables were then constructed to investigate the relationship between fear of death and each of six variables; and the distributions tested for significance by use of the χ^2 test. The variables were: 1) health (good vs. poor); 2) age (60-69 vs. 70 or more); 3) religion (Catholic vs. Protestant); 4) religiosity (religiously staunch vs. religiously indifferent or atheistic); 5) schooling (up to eighth grade vs. high school or higher); and 6) sex (male vs. female). Of the six variables, only the first proved to be significantly related to fear of death; those patients with better health were less afraid of death than those with poorer health. The negative findings with regard to the other five variables do not agree with the findings from other studies. For instance, Feifel (1959) states, "The religious person, when compared to the non-religious individual, is personally more afraid of death," but this was not borne out in the present study. Later Feifel states, "Women tend to think more about death than do men" (although "we should not forget that there is no necessary relationship between thinking about death and fear of death"). The present study indicates that in this group of geriatric psychiatric patients, men and women are equally afraid of death.

Patients' expressed opinions. Of the 62 patients, 54 had never talked to anyone about death or dying before this interview. This agrees with Feifel's statement (1959), "It is noteworthy that in all the groups, particularly the terminally ill patients, some find thinking about death so anxiety provoking that they deny having any ideas at all about it." This is particularly striking in the present study because most of the patients came from homes or hotels with a large population of older people; and many had had friends or relatives who had recently died. One patient did state, "Oh, yes, but my family immediately say, 'Why do you have to talk about such a morbid topic? You should be grateful to be alive.' "

One third of the patients stated they had a will, or some other plan for the disposal of their effects after their death; one-third had no interest in discussing this; and one-third stated, "The state will take care of that."

Of 48 patients, 23 favored capital punishment, 4 were noncommital, the rest were against it. Ten patients favored mercy killing, about half of them making a restriction; one said, "Yes, but you should have a priest, a lawyer, the patient, and three doctors there at the time of decision." Most of those who were against euthenasia were markedly angry and agitated; for example, one said, "The doctor should be put to death!"

To the question, "If a patient is going to die soon should the doctor tell him?" 23 of 47 patients said yes, and all said they personally would want to be told. A few volunteered that they only wanted to know a few days or hours beforehand . . . "So I could get myself ready, but not too long, or I would get too upset." Those who did not want to be told were often defensive; one said, "There are too many times when the doctor is wrong." This one question aroused the most anxiety, and with about 30 per cent it was necessary to explain that the question was part of a research

project and did not refer to them personally. When asked, "would you want—(closest relative or friend) to be told if he were going to die soon?" 17 of 35 said no, 4 refused to commit themselves, the rest said yes.

When asked to choose between being bedridden for the next three years or dying tomorrow, 15 of 32 patients chose dying, 8 refused to say, and 10 chose living. When asked, "If you had a choice of dying tomorrow or being in severe pain for a year, but knew you would be O.K. at the end of that time," 14 of 32 chose living, 10 refused to commit themselves, and the rest chose dying.

When at the end of the interview, it was explained that the questions were for research and had nothing to do with their specific situation, almost all the patients showed signs of decreased anxiety. Asked how they had felt about the questions on death, and whether doctors in general should discuss death with their patients, 15 of 57 stated they had enjoyed the discussion, or had been grateful or proud to have been asked these questions. Another 17 stated they did not mind talking about it, or had accepted talking about it in a bland, emotionally uninvolved way, and 23 ranged from saying that they were fearful of the questions to stating that they disliked talking about death. A very few of these 23 became frankly suspicious or abusively hostile.

SUMMARY AND DISCUSSION

One hundred acute psychiatric geriatric patients consecutively admitted to the San Francisco General Hospital were examined in this pilot study. Sixty-two could give relevant answers to most of the questions on their attitudes towards death. The patients were fearful of death, but as a whole were willing, and in some cases were relieved to discuss it. Even some physically terminally ill patients with severe psychiatric symptoms were able to discuss the topic, at times with evident relief.

It has been said that the topic of death is as taboo today as the topic of sex was during the nineteenth century. Since the direct outcome of many diseases in this age group is death, it would appear that it is the physicians' duty to acquaint his patients with this fact and to help them deal with the attendant fears. Eighty-nine per cent of the patients in this study needed supervision at least at night because of physical illness, and 87 per cent stated they had never talked about death or dying before. One can speculate that at least some of their psychiatric symptoms, which often included fear of being poisoned, killed or thrown out of their homes, as well as frank, somatic delusions, may be symptoms of marked denial of death. It would seem that with this marked denial of death it becomes incumbent on the physician to broach the topic with his patient, and not to wait for the patient to raise the question of his approaching death.

ABSTRACT

An Analogue of Resistance to Death Awareness

LAWRENCE G. COREY, M.A.

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The purpose of this study was to determine empirically whether four operationally-defined modes of coping with death awareness differed in the frequency of their occurrence within and between samples of young and old subjects.

A Sarbin-like, forced-choice projective instrument was administered to 200 subjects—145 persons aged 16 to 21, and 55 persons aged 55 to 65. In the first presentation the respondent was asked to decide if the figure was "sleeping" or "dead"; in the second presentation, whether it was "lifeless" or "napping." Changes in responses between first and second presentations were analyzed.

The old and young subjects were treated as separate populations. Within and between the two age groups critical ratios were computed for the proportions of subjects falling under each of four modes of coping with death awareness, modes derived from the subjects' changes in response: avoidance; acceptance; neutralization; and suppression.

No statistically significant differences were found in the between-groups analysis. The within-group analysis showed: 1) within the older sample, avoidance occurred disproportionately often; and 2) within the young sample, acceptance and neutralization occurred with equal frequency. The order of preference for modes by which young subjects coped with death awareness thus differed markedly from that of old subjects.

Discussion

COMMENTS by J. M. A. Munnichs, Ph.D. *(Gemeenschappelijk Instituut voor Toegepaste Psychologie, Nijmegen, The Netherlands).*

My comments concern, successively, the statement of the problem; the methods; the subjects investigated; and the results and their interpretation.

It is very desirable that researchers into attitudes toward death are aware of the complex nature of the problem. This already appears from the different ways in which the problem is approached by the various authors. Corey speaks of "modes of coping with death awareness"; Rhudick speaks of "death concerns"; Swenson, of "a death attitude construct"; Jeffers, of "attitudes toward fear of death"; and finally, Christ speaks of "feelings about death." This enumeration proves that there are various problems: Are older people especially aware of death? What is the attitude of older people toward death? Does this attitude differ from the ones held by people of other ages? On what does this depend? And with what factors does it correlate?

However, this is only one side of the problem. The other is: What is the *meaning* of death in this context? It is easy to investigate what is somebody's attitude toward, say, sports; but the attitude toward death is closely connected with whether or not death has some personal meaning. Have dying and death becomes a personal possibility? Dying and death are not neutral data for the person and certainly not for older persons. If we have not solved the problem of the *meaning* of death, the other problems are still up in the air.

Another problem is this: According to the literature, the relation between fear of death and old age is not close. The American data (Havighurst, Fried, Stern, Shrut) and the European experiences of E. Stern, Minkowski, Rümke, and Vischer indicate more that death is familiar to older persons. What is familiarity in this connection? And in what way can we explain and understand this familiarity?

Death and awareness of death are questions of such complex nature, then, that it is impossible to investigate the problem without a fundamental discussion of these points.

With regard to method: notions of death in older persons are probably closely connected with the intimate core of the personality. They often form a rather vaguely conscious aspect of personality. When you ask somebody all at once: "Are you afraid to die?", his answer will often not be real. Many older persons have reflected on this topic only seldom or superficially; and such a question often surprises them. So their negative reply is a *defence* against the question abruptly posed, more than a real answer to the question. The questions to be posed *demand* a suitable context.

Projective techniques may satisfy, provided they are well used. In this connection group-investigation is an unreliable method, for a frank and reliable response supposes a certain familiarity between subject and interviewer. Neither does a short, forced-choice projective method (as used by Corey) seem sufficient if there is no further information available. The operationalizing of the different "modes" seems, moreover, risky; and therefore it must first be tested as to its validity.

In short, it will be possible to investigate this area reliably only when a method is applied which corresponds with the individual personality of the subject.

Differentiation must be made between *old* persons and *older* persons. Most of the subjects investigated are 60 years of age and older. The age range is too large: 55 (Corey) to 90 years (Rhudick). Other studies have shown that people between the years of 45-50 and 60-65 have ideas and attitudes different from those of persons aged 70 and older. The first group stands in a different psychological situation in the life span than the retired and old persons. From the point of view of a psychologist, we have too heterogeneous groups in the various studies reported here.

Further, it is necessary that we also make sufficient differentiations in accordance with the various social classes of the subjects. It is certainly possible that well-educated people have a different life perspective than the less educated. (See one of the concluding remarks by Swenson).

With regard to the interpretation of findings: Results must always be interpreted in the light of the methods applied and the subjects investigated. Without doing so, a confusion arises, because the various investigations apparently produce conflicting results. The fact is that the remark by Swenson, "Those in poor health tended to look forward to death," and the conclusion of Jeffers, that "fear of death was found to be associated with greater concern over health as expressed by the subject," and the remark by Christ, "Although most patients deny a fear of death, all show varying degrees of fear and anxiety about this topic,"—all these must be contained in one single theoretical formulation. In a detailed research it might appear that: 1) the method applied is often the cause of a certain result; and 2) we have not sufficiently reflected upon the relation between personality structure and attitude toward death. It is true that the results which we obtain through interview and questionnaire data on old people deviate from the results obtained from projective test data and psychiatric data. There is no doubt that on the one hand the difference is due to the method. On the other hand, we think that the subjects also create difference in results. Evidence for this is to be found in these papers. Rhudick indicated: "High death concern relates to neurotic traits." Swenson has ascertained: "Living alone tended to be associated with the fear of death." Jeffers concluded: "Fear of death was found to be associated with feelings of uselessness." And finally, Christ observed "varying degrees of fear" in his patients. These various conclusions might be reconciled as follows: Attitude toward death, insofar as this attitude is *fear* of death, makes its appearance whenever we deal with persons who are not mentally healthy. So the relation with the personality structure would have been proved. Another reason for this relation is that often no correlation existed with social and milieu factors. If this would be true, we would again face the question, Of what is the attitude toward death the expression? Involuntarily we create at the same time the question, What are we to think of the death-instinct of Freud?

COMMENTS by Herman Feifel, Ph.D. (*Research Center for Mental Health, New York University*).

No area of research asks for a deeper understanding than the meaning of death for people. It reaches into practically every field of biological functioning and social thinking. If we view each phase of the life cycle as being characterized by specific developmental tasks, I think it is clear that the unique feature of old age is the inevitability of death, bringing with it the tasks of integrating one's past life and the acceptance of one's own death.

Despite this, one is impressed with how little systematized knowledge there is about attitudes toward death in the older person, or indeed, in the person of any age.

The studies we have heard reported this morning are empirically oriented. This is to be expected in a new area of exploration where theoretical formulations must wait upon an accumulation of descriptive and empirical data.

I shall limit my comments to (A) two possible fruitful leads, as I see them, for future study, and to (B) a few methodological considerations.

The interesting findings of Rhudick and Dibner and of Christ indicate the need for more organized examination of the association between emotional difficulties and attitudes toward death. They report that death concerns are related to neurotic tendencies in the older person; that death concerns can be expressed indirectly via somatic symptoms and withdrawal tendencies rather than by outward anxiety; and that psychiatric symptoms may be the road taken by some aged patients to consciously deny concern about death. (I myself hold the hypothesis that one of the functions of schizophrenic denial of reality, in specific cases, is to serve, in some way, as a magical holding back, if not undoing, of the possibility of death. If living leads inevitably to death, then death can be fended off by not living.) Additionally, Christ finds that the topic of death can apparently be discussed with older persons without a necessary rise in the incidence of people leaping out of open windows. (This, incidentally, reinforces my own results in working with medically ill older persons.) Fears about dis-

cussing the topic of death and coming to grips with attendant feelings reflect, more often than not, the orientation of the examiner and professional person rather than that of the subject or patient.

Another reason for attending to this association between emotional disturbance and attitudes toward death is the noted psychotherapeutic effect which occurs in certain older psychiatric patients when death is discussed with them. My research discloses that this is true not only for some of the patients in Christ's sample but for an even more sizeable proportion of seriously ill and terminally ill older persons as well—and, in fact, occurs at all of the adult age ranges. Patients actually thanked me for affording them the opportunity to talk about their thoughts and feelings, fears and hopes, concerning dying and death.

Experience has shown that certain problems can sometimes be revealingly approached in their exaggerated manifestations. Through study of pathology, neuroses, men under stress, we have learned many of our initial truths about normal functioning.

The work of Swenson and of Jeffers, Nichols, and Eisdorfer directs attention to the necessity for more detailed observation of individual differences. Death is a multi-faceted symbol whose specific import depends on the nature of the individual's development and his cultural context. "Death is terrible to Cicero, desirable to Cato, and indifferent to Socrates." Even similar attitudes toward death may be present in different individuals in differing configurational weights and interactions. Of supplementary value would be the determination, not only of qualitative and "process" characteristics of attitudes toward death, but also of the *kind* of person who holds these attitudes toward death.

With regard to method: We note a few contradictions in some of the results reported today. This should not be too upsetting at this stage. Contrary findings do exist at times. My own work with seriously ill patients, for example, shows no necessary either-or dichotomy with respect to their attitudes toward death—many hold simultaneous attitudes of both denial and acceptance of death. This outlook is evidenced in much of Western tradition itself, with its assumption of death as representing both "wall" and "doorway." Previous experience in other fields demonstrates, additionally, that seeming contradictions often reflect different parts of the same elephant.

Nevertheless, it is gratifying to hear cautions stated about generalizing from the data presented and the acknowledged need for increased methodological rigor and sophistication. What are some major requirements?

1. The broadening of population samples—as an example, Corey's paper illustrates that older people apparently have a different order of preference modes in coping with awareness of death than do younger people. This underscores the necessity for both more intra- and inter-group studies.

2. Cross validation of results must not be overlooked.

3. Checking on the reliability of our instruments, particularly when we utilize home-made variants.

4. Refining the elegance of our measuring tools—take, for instance, Swenson's interesting result that a positive relation exists between religiosity and religious activity and a forward-looking attitude toward death. This would have more cogency, if the MMPI religious scale were a measure that enabled us to distinguish between religious sentiment that has to do with personal psychological needs (is self-serving, conferring safety, status, and talismanic favors upon the believer) from that in which religion is accepted as an end in itself (is intrinsic, larger, and wholly beyond self). Religious activity can be an outgrowth of "defensive measures" as well as of sincere belief. Furthermore, religiosity, as rated from a questionnaire, may express a true way of life, but sometimes also mirrors only a verbalistic philosophy. We must be cautious in considering the "religious" person as invariant; the same holds for the non-religious individual.

5. There is no question about the impressive leverage which direct verbal questioning affords us in gaining information. Its most effective use, however, demands broad coverage of the dimensions we seek to investigate. We need to obtain responses to a variety of problem situations rather than to just a few discrete questions. And in this framework, the social-cultural situation is a variable which also must be calculated. Open expression of non-religious views in a closely knit, religiously-oriented, small Southern community may not be the politic thing to do, particularly when talking

to strangers who possibly are also of a different racial background than oneself. Even under optimal circumstances, as Miss Jeffers and some of the others have pointed out, we still face the limitations of accepting conscious materials at face value.

6. The multi-level analysis furnishes a promising correction to some of the drawbacks inherent in conscious data. There are undoubtedly difficulties in incorporating this approach into certain studies. Nevertheless, it is a worthwhile goal for which to aim. It permits us to tap differing levels of psychic and physiological performance in arriving at a rounded and hierarchical picture of the subject's functioning. The tools of the experimental laboratory, autonomic and subliminal measures, genetic materials, dream life, projective tests—all can play a role here. I was pleased to note the productive use made of the TAT to tap fantasy production level in the Rhudick and Dibner paper, as well as Swenson's development of an empirical checklist.

7. Another rewarding path, I think, is the one of longitudinal analysis. Most of the data we do have deal with comparison of differences between young and old; few indicate progressional changes during adult life. Death may mean one thing for us at age 20, another at age 40, and something quite different at age 60.

I think, for example, that an aspect like the temporal nearness or distance of death for the individual (something I am paying close heed to in my own research) provides us with a powerful spotlight for illuminating people's attitudes about death. It is wholly conceivable that our perception of the world and the attitudes we hold concerning death as we talk here today might not be quite the same next week, if we were then informed that we had a mestastasizing cancer.

To conclude: It is heartening to see the discerning recognition by the participants in this Symposium that the concept of death is not purely a biologic event, but rather one of substantial psychological and social importance. The papers have been instructional; they cannot but enhance our understanding of the older person and his ideas concerning death.

COMMENTS by Jean-René Treanton, Ph.D. (*University of Lille, France*).

Attitudes toward death comprise a field of research in which sociology and comparative anthropology have a very important word to say. Any society provides some institutional protection against the threat for personality equilibrium that the idea, or the proximate advent, of death represents for the individual. For instance, the burial rituals and ceremonials of a society are functionally intended to comfort the living, to assist against loneliness, or to protect against the revenge of the dead. (For European researches on the sociology of death, see Morin [1951], Vuillemin [1948], and Hertz [1905]). Thus, we could formulate a general question: In what measure are individual attitudes toward death conditioned by the institutional arrangements, the mores, and the rituals provided in the social environment?

From this viewpoint, a comparative psychosociology of funerals could provide some fruitful insights. Another field of interest might be the problem of acculturation to death among children; the first contact with death is certainly of momentous influence on attitudes and behavior in the adult years. (Researches on the importance of death to the child include Anthony [1940]; Thomas [1937]). Some differences probably exist, here, between children in rural and in urban milieux.

At the other end of life, accommodation of old people to the idea of death differs greatly from culture to culture. Insofar as there exist some "techniques of wisdom" which are a part of the philosophical and literary inheritance of a society, those techniques are also relevant to anthropologically-oriented studies of death attitudes.

Attitudes toward death are strongly conditioned by the strength of the ties by which the individual is integrated within the social organization: this has been very clearly exemplified in the studies of suicide by Durkheim and others. The problem, for each of us, is how not to die alone. Death is not only a psychological, but also a social problem.

COMMENTS by Robert L. Fulton, Ph.D. (*Department of Sociology, Los Angeles State College, California*).

In listening to these papers this morning one thing stands out above everything else, and that is the contradictory nature of their findings.

Thus Christ, for example, reports that fear of death was not affected by age, education, sex, religion or religiosity. Swenson, to the

contrary, reports a positive relationship between religiosity and one's attitudes toward death. Moreover, education for Swenson appears to be a significant factor. Rhudick and Dibner, who chose to hypothesize that death concerns were a function of personality factors *per se*, report that high death concern was related to high scores on both the physical and psychiatric disturbance sections on the Cornell Medical Index. Swenson, however, tells us that those people reporting poor health most often looked forward to death in a positive manner, whereas those reportedly in good health were most actively evasive or defensive in their behavior. Jeffers *et al.*, on the other hand, concur with Swenson and disagree with Christ and Rhudick and Dibner—and so on.

Combined with the short reviews of previous studies of attitudes toward death heard here, one is tempted to say that our confusion in this area is almost complete. The contradictory nature of these findings, however, I am certain is more apparent than real. Further, I would guard against hastily concluding that these differences in the findings reflect the superiority of one technique over another as employed by the authors. It would seem that, depending upon the type of sample desired and the conditions governing the research, any one of the techniques described or several of them in combination might profitably be employed in research of this nature. However, the most reliable of techniques available falls short of its intended purpose if the researcher fails to respect the importance of correct sampling procedure. The nub of the problem of these diverse findings is here, I think. For example, Christ based his conclusions on essentially the expressed attitudes of only 62 people admitted to a psychiatric ward and who, it must be emphasized, did not always know the true nature of the questions asked. Rhudick and Dibner, on the other hand, based their findings on the replies of 60 normal adults, members of an Age Center who volunteered to participate in their study. Swenson's sample of respondents is different again. His group of 210 persons was recruited from Golden Age Clubs, rest homes. and organizations employing the aged. His sample is three-quarters female, all volunteers, with no follow-up on those who failed to cooperate in the study. Finally, Jeffers' group of 260 volunteer adults consists overwhelmingly (94 per cent) of persons with close church affiliations.

In no case can it be said that the demographic variables were treated in such a manner as to afford even a modicum of representativeness for the stated groups or sub-groups studied. In addition, the composition of the groups reported on here are so diverse in so many ways as to allow one to readily expect what indeed was found here today: contradictions in the results.

If we agree with Rhudick and Dibner, however, and view the *expressed* attitude as superficial public behavior and essentially epiphenomenal in character, reflecting or disguising the basic or real disposition or attitude, then these contradictions we have pointed out are illusory. They merely reflect the failure of the other researchers to apply the proper techniques of research. With this opinion goes as well the tacit or open belief that one group of respondents is as good as another for such research. As the search is for a neurotic syndrome, such considerations as education, class, sex, occupation, race, and religion are at best incidental; and at worst, they obstruct one's effort at getting at the *real* personality structure or at the *real* attitudes or fears of the individual. Without wishing to be unjust, I think we can paraphrase Rhudick and Dibner's findings by saying: emotionally disturbed people in general are also disturbed about death. This is undoubtedly true, but what does it tell us about the *basis* of that fear of death? There is no question that word association tests and other techniques employed to get around the mechanisms of defense and repression do indeed produce differences in reaction time and/or differences in perception among respondents. We are not necessarily justified, however, in concluding that this demonstrates an anxiety about death which is rooted in the personality structure of certain individuals. Rather, it can be argued equally as well that what is being recorded is a stronger reaction to the taboo our culture places upon death and to all those things which an individual comes to associate with it.

What I am afraid might be forgotten here is that there is a traditional cultural definition of death as well as personal attitudes toward it. They may or may not be in agreement. When they are in agreement, then, as Jeffers found out, few religious people admitted any fear of

death. We are begging the question if we accept Jeffer's argument that these people are *really* anxious about death, but choose to deny it by holding certain religious convictions. It should be remembered that whether He is real or fanciful, some people do actually believe in God. This being undeniably true, it would appear reasonable that the faithful cannot readily believe in the promise of salvation and at the same time admit to a fear of death—as the wages of sin, possibly yes—as the portal to immortal life, no. If it is admitted that death is a taboo subject in America, then it is possible that the delayed reaction found with the word association tests reflect *this* fact rather than any fundamental death anxiety.

What I would like to suggest finally is that as a society America is moving away from the traditional, i.e., religious, view of death. Death is no longer the wages of sin but the wages of loose living; and concomitantly, the fear of death is no longer the fear of judgment, but another expression of a neurotic personality.

Modern industrial America with its emphasis upon long cars, long vacations, and longevity has struck a new note in the minds of men. Given the emphasis upon individualism and the inviolability of the person coupled with the relative decline of traditional views, death becomes an infringement upon our right to life, liberty, and the pursuit of happiness. What are we to do with it? How are we to cope with it? I would say that as never before we choose to disguise it and pretend that it is not the basic condition of all life. That this is so is suggested in a study I conducted recently throughout the United States in which I attempted to elicit the attitudes of the American clergy toward death and funerals. The results of my study showed most clearly that the Protestant clergy believed their major function at a funeral was to attend to the living and their needs rather than to the departed dead.

REFERENCES

Alexander, I. E., & Adlerstein, A. M. Death and religion. In H. Feifel (Ed.), *The meaning of death.* New York: McGraw-Hill, 1959. Pp. 271-283.

Altrocchi, J., & Eisdorfer, G. A Comparison of attitudes toward old age, mental illness and other concepts. Paper presented at the Fifth Congress of the International Association of Gerontology, San Francisco, August, 1960.

Anthony, S. *The child's discovery of death.* New York: Harcourt, Brace, 1940.

Beard, B. B. Social adjustment in extreme old age. Paper presented at the First Pan-American Congress on Gerontology, Mexico City, 1956.

Busse, E. W., Barnes, R. H., Silverman, A. J., Thaler, Margaret, & Frost, L. L. Studies of the processes of aging. X. The strengths and weaknesses of psychic functioning in the aged. *Amer. J. Psychiat.*, 1955, **12,** 896-901.

Chandler, A. R. Attitudes of superior groups towards retirement and old age. *J. Geront.*, 1950, **5,** 254-261.

Cottrell, Lilian. An MMPI scale for the measurement of religiosity. Unpublished. Available through the Graduate School of the Univer. of Minnesota.

Eissler, K. R. *The psychiatrist and the dying patient.* New York: International Universities Press, 1955.

Faunce, W. A., & Fulton, R. L. The sociology of death: a neglected area of research. *Soc. Forces,* 1958, **3,** 205-209.

Feifel, H. (Ed.) *The meaning of death.* New York: McGraw-Hill, 1959.

Feifel, H. Older persons look at death. *Geriatrics,* 1956, **11,** 127-130.

Feifel H. Attitudes of mentally ill patients toward death. *J. nerv. ment. Dis.,* 1955, **122,** 375-380.

Ficarra, B. J. Psychological management of the aged surgical patient. *J. Amer. Geriat. Soc.,* 1960, **8,** 59-60.

Golde, Peggy, & Kogan, N. A sentence completion procedure for assessing attitudes toward old people. *J. Geront.,* 1959, **14,** 355-363.

Guttentag, O. E. The meaning of death in medical theory. *Stanford med. Bull.,* 1957, **17,** 165-170.

Hathaway, S. R., & McKinley, J. C. *Manual for the Minnesota Multiphasic Personality Inventory.* New York: Psychological Corp., 1945.

Hertz, R. Representation collective de la mort. *Année Sociologique,* 1905-06, **10,** 48-137.

Hocking, W. E. *The meaning of immortality in human experience.* New York: Harper, 1957.

Klopfer, W. G. Attitudes toward death in the aged. Unpublished Ph.D. dissertation, City College, New York, 1947.

Landsberg, P. L. *The experience of death.* London: Rockliff, 1953.

Lindzey, G., & Goldberg, M. Motivational differences between male and female as measured by the Thematic Apperception Test. *J. Pers.,* 1953, **22,** 101-117.

Linn, L. The role of perception in the mechanism of denial. *J. Amer. psychoanal. Ass.,* 1953, **1,** 690-705.

May, R. *The meaning of anxiety.* New York: Ronald Press, 1950.

Morin, E. *L'homme et la mort dans l'histoire.* Paris: Corrêa, 1951.

Murray, H. A. *Thematic Apperception Test manual.* Cambridge: Harvard Univer. Press, 1943.

Nagy, M. H. The child's view of death. *J. gen. Psychol.,* 1948, **73,** 3-27

Natanson, M. Death and situation. *Amer. Image*, 1959, **16,** 447-457.

Neugarten, Bernice L., & Gutmann, D. L. Age-sex roles and personality in middle age: a thematic apperception study. *Psychol. Mongr.*, 1958, **72,** No. 17 (Whole No. 470).

Nunnally, J., & Kittross, J. M. Public attitudes toward mental health professions. *Amer. Psychologist*, 1958, **13,** 589-594.

Osgood, C. E., Suci, G. J., & Tannenbaum, P. H. *The measurement of meaning.* Urbana: Univer. of Illinois Press, 1958.

Peatman, J. G. *Descriptive and sampling statistics.* New York: Harper, 1947.

Scheler, M. Tod und Fortleben. *Schriften aus dem Nachlass.* Vol. 1. Berlin, 1953.

Schilder, P. *Goals and desires of men.* New York: Columbia Univer. Press, 1942.

Schilder, P., & Bromberg, W. Attitude of adults toward death. *Psychoanal. Rev.*, 1933, **20,** 133-185.

Scott, C. A. Old age and death. *Amer. J. Psychol.*, 1896, **8,** 67-122.

Shrut, S. D. Attitudes toward old age and death. *Ment. Hyg., N. Y.*, 1958, **42,** 259-266.

Shrut, S. D. Old age and death attitudes. Unpublished Ph.D. dissertation, New York University, 1955.

Swenson, W. M. A study of death attitudes in the gerontic population and their relationship to certain measurable physical and social characteristics. Unpublished Ph.D. dissertation, Univer. of Minnesota, 1958.

Thomas, M. Méthodes des histoires à compléter pour le dépistage des complexes enfantins. *Arch. Psychol., Genève,* 1937, **26,** 209-284.

Vuillemin, J. *Essai sur la signification de la mort.* Paris: Presses Universitaires de France, 1948.

Wahl, C. W. The fear of death. *Bull. Menn. Clinic.*, 1958, **22,** 214-223.

THE RELATIONSHIP OF ACTIVITIES AND ATTITUDES TO PHYSICAL WELL-BEING IN OLDER PEOPLE*

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There has been very little research to date on the relationship of older people's physical capacities to their activities and attitudes. In Harold Meyer's North Carolina survey of recreation for the elderly, older people were asked, "Are there any reasons for your not taking up new hobbies or interests?" Fifty-five per cent of those answering gave such reasons, and of these nearly half stated that health and/or afflictions were responsible (Institute for Research in Social Science, 1956). Cavan, Burgess and Goldhamer (1949) and Havighurst and Albrecht (1953) have studied thoroughly the activities and attitudes of older people; but they did not obtain detailed medical examinations to measure objectively the physical functional capacities of these same older people.

The interdisciplinary research program at Duke University Medical Center is studying older persons still active in community and/or family life. A two-day series of examinations on a biracial (white and Negro) group of community volunteers over 60 years of age included intensive physical, psychological and social evaluations. This investigation provides a unique opportunity to study the relationship between the older individual's physical functional capacity on the one hand, and his activities and attitudes on the other.

THE SUBJECTS

Two hundred and fifty-one community volunteers from the Piedmont section of North Carolina were included in the present study. Initially subjects were recruited by means of appeals at Golden Age Club meetings and through letters to retired university professors and school teachers. A few came in after having seen radio and television programs describing this research, though no appeal for volunteers was made through these media. Others were recruited through staff contacts of various kinds, but the greatest number signed up because of acquaintance with the older subjects themselves who had appreciated the opportunity to participate. Subjects were required to come to Duke Hospital for two separate days of examinations and interviews; therefore bedridden, immobile or socially isolated persons were omitted from the sample. No elderly persons living in institutions were included in this phase of the investigation.

The age range for the group was 60 to 94 years, with a median age of 70. 41 per cent were men, 59 per cent women, 67 per cent white, and 33 per cent Negro. These ratios are comparable to those of the total Durham population. In regard to socio-economic status the group is somewhat over-weighted at the upper level, 40 per cent of the subjects (or their spouses) having been business executives or professional workers. The remaining 60 per cent come from lower socio-economic groups, corresponding generally to the lower middle and lower classes of Warner's classification (Warner, Meeker, & Eells, 1960).

THE VARIABLES

1. *Physical Functional Rating.* A physician scored the level of present physical functioning for each subject on the basis of the following studies: medical history and mental status; physical and neurological examination; dermatological examination; ophthalmological examination; otological examination, including audiogram; chest x-ray; electroencephalogram. electrocardiogram; ballistocardiogram; laboratory studies of the blood (complete blood count, hematocrit, cholesterol, blood urea nitrogen, and glucose); and urinalysis.

The physical functional rating is modified and adapted from those in use by the U. S. Army and Veterans' Administration for rating disability. Criteria were based on the subject's capacity to function in his everyday life situation. For instance, to the extent that arthritis

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precludes finer coordinated movements of the hand, such as those used in knitting, crocheting, doing small toolwork or tying shoe-laces, this is rated as 20 per cent disability.

The scoring on physical functional rating for the 251 community subjects is as follows: 0 (no pathology), 19 per cent; 1 (pathology, no disability), 30 per cent; 2 (pathology, 0 to 20 per cent disability [mild]), 25 per cent; 3 (pathology, 20 to 50 per cent disability [moderate]), 17 per cent; 4 (pathology, 50 to 80 per cent disability [severe]), 8 per cent; 5 (pathology, 80 to 100 per cent disability [total]), 1 per cent.

2. *Activities and Attitudes.* This material was included as part of the social history obtained in personal interviews with the older subjects.

The Activity Inventory is that developed by Cavan, Burgess, Havighurst, and Goldhamer (1949) and consists of a series of 20 questions dealing with the older person's participation in the following areas: 1) intimate contacts (with family and friends); 2) leisure (ways of spending time, hobbies, reading, organizations); 3) security items (present work status, including housekeeping for women, and economic pressures); 4) health problems and difficulties; and 5) religious activities (attendance at religious services or listening to them on radio and TV, reading religious literature). A total activity score is obtained by adding the scores in these five categories.

The Attitude Inventory has a series of 56 agree-disagree items dealing with the older person's own satisfaction with his activities and status in regard to: friends, family, work, religion, health, economic status, general state of happiness, and feeling of usefulness. The total attitude score is obtained by adding the scores in eight areas. Since the items on the Attitude Inventory are composed of statements which all have references to self, they can be regarded also as indicators of self-image. Thus the scores might be interpreted as the degree of favorableness or unfavorableness with which the older person views himself in terms of the eight given areas of his experience.

A thorough discussion of these inventories, their purpose, use, reliability and validity is to be found elsewhere (Cavan *et al.*, 1949; Havighurst & Goldhamer, 1953). The inventories have been used extensively throughout the United States.

RESULTS

The variables in this study were analyzed by the χ^2 technique and coefficients of correlation were computed between the major variables. The following results were obtained:

1. Older people with no disability have higher total activity scores than do individuals with mild to severe disability. Of the individuals with low activity scores, there are about three times as many disabled as there are those with no disability. Conversely, of those individuals with high activity scores, nearly three times as many are not disabled compared with those having mild to severe disability. The bi-serial correlation coefficient between these two variables, although significant, is rather low, .39 (Table 1).

2. Older people with no disability have higher total attitude scores than do individuals with mild to severe disability. Total attitude score is not as strongly related to physical functional rating as is total activity score. However, among those having low attitude scores, there are twice as many disabled individuals as those who have no disability. The bi-serial correlation coefficient between physical functional rating and total attitude scores is .20 (Table 1).

3. High total activity scores are significantly associated with high total attitude scores. The product-moment coefficient of correlation between these two variables is .54 as shown in Table 1.

4. All categories of the activity scale are significantly related to physical functional rating except religious activity. High activity scores are associated with no disability. Table 2 lists the five categories of the activity scale and gives the significance level of χ^2 for each.

5. In contrast to activities, none of the categories on the attitude scale is related to physical functional rating, except for attitude toward

TABLE 1. CORRELATIONS BETWEEN THREE MAJOR VARIABLES.

	Correlation Coefficient	Level of Significance
Physical Functional Rating vs. Total Activity Score	.39[a]	.001
Physical Functional Rating vs. Total Attitude Score	.20[a]	.01
Total Activity Score vs. Total Attitude Score	.54[b]	.001

NOTE.—Good physical functioning is associated with high activity and high attitude scores. High activity score is associated with high attitude score.

[a] Bi-serial coefficient of correlation ($N = 245$).

[b] Product-moment coefficient of correlation ($N = 245$).

religion. In the latter case an inverse relationship was found, a high score being associated with disability. The majority of individuals with high religious attitude scores are disabled. The eight separate categories on the attitude scale are given in Table 2 with the χ^2 levels of significance.

6. High scores on the activity and attitude scales in the same categories are significantly related, *i.e.*, health activity with health attitude, intimate contacts with attitude toward friends and toward family, security activity with economic security attitude, and religious activity with religious attitude. The relationships of these categories according to χ^2 level of significance are shown in Table 2.

DISCUSSION

As shown above, when the sum of the scores of all the activity items was run against physical functional rating, a significant relationship was found. In order to avoid possible contamination of the results of plotting one health variable against another, the health item was deleted from the total activity score, which then was composed only of items in the areas of intimate contacts, leisure, security and religion. Even with this deletion, the relationship remained statistically significant.

In a similar way, the health attitude item was deleted from the total attitude score. The relationship between total attitudes and physical functional rating was still significant.

So far as the separate items on the activity scale are concerned, it can be said that older people with no disability are more likely than those with mild to severe disability to have the following characteristics: a) have few symptoms of illness and/or disability and days spent in bed (health item); b) be married and have frequent contacts with family and friends (intimate contacts item); c) engage in a variety of activities and hobbies, active in a number of organizations and doing much reading (leisure item); d) be employed or occupied with housekeeping; no change in standard of living because of lowered income (security item).

However, persons with no disability are no more likely than those with mild to severe disability to attend religious services, to listen to church services over the radio or TV, or to read religious literature (religious item).

Concerning the findings on the attitude scale, on the other hand, the statistically significant relationship of the total attitude score to physical functional rating is presumably the result of a cumulation of non-significant relationships (all except for religion) reinforcing each other (Table 2). That is, for the seven other areas of an older person's attitudes, there are trends toward association but no statistically significant relationship shown to his physical well-being. It may be speculated that this is due to the persistence of attitudes which have developed slowly over a life-long period.

In regard to the religious attitude item, there is evidence from most of the older subjects that religion means more to them as the years go by and the end of life approaches. For persons with disability this end is more imminent and they wish to become more closely associated with the solace and comfort of religion. This fact may account for the finding that disabled persons hold stronger religious convictions.

This finding may also explain why religious activity in turn is not significantly associated with physical functional rating. The disabled older person, although more handicapped and less able to take part in religious activity, is nevertheless much more highly motivated than the well person to do so.

TABLE 2. RELATIONSHIPS OF ACTIVITIES AND ATTITUDES TO PHYSICAL WELL-BEING.

	χ^2 Level of Confidence
Physical Functional Rating vs:	
Total Activity Scale	.001
Total Activity Scale (minus Health Activity)	.001
Health Activity	.05
Intimate Contacts	.02
Leisure Activity	.01
Security Activity	.01
Religious Activity	.50
Physical Functional Rating vs:	
Total Attitude Scale	.001
Total Attitude Scale (minus Health Attitude)	.01
Health Attitude	.10
Friends Attitude	.30
Work Attitude	.10
Economic Security Attitude	.20
Religious Attitude	.01
Feeling of Usefulness	.30
Family Attitude	.90
Happiness	.10
Total Activity Scale vs. Total Attitude Scale	.001
Health Activity vs. Health Attitude	.01
Intimate Contacts vs. Friends Attitude	.001
Intimate Contacts vs. Family Attitude	.001
Security Activity vs. Economic Security Attitude	.001
Religious Activity vs. Religious Attitude	.001

NOTE.—Good physical functioning is associated with high activity and high attitude scores with the exception of religious attitude, where an inverse relationship is found. High activity scores are associated with high attitude scores.

Havighurst and Albrecht (1953) reported an over-all study of older people in a small midwestern city. They devised a health handicap score based on subjective health evaluations, with half the number of these evaluations being reviewed by physicians. The product moment correlations of the health handicap scores with two of the scores for which the Duke research team tested relationships with its objective physical functional ratings are as follows: Health Handicap Score vs. Health Activity, – .53; Health Handicap Score vs. Health Attitude, – .56. This indicates, as the authors point out, that the older person's "subjective feeling about his health was not completely determined by the extent and severity of his health handicaps." The defect in this calculation, which the authors would readily acknowledge, is that the health handicap score was largely a subjective rather than an objective health rating and not arrived at independently by a physician; thus the relationship tends to be predetermined. The Duke study accordingly offers a more objective evidence of the same relationship between physical disability and total activity and attitude scores.

In conclusion, a few interesting speculations occur as to how physical disability may operate on activities and attitudes. First, it tends to disqualify a person for certain activities, as in the case of a serious arthritic not being able to continue to play golf. However, disability does not act indiscriminately: locomotor activities, for instance, are cut off more quickly than the passive and more sedentary varieties. Secondly, if earning capacity is cut by disability, certain activities—such as travel, membership in expensive clubs and the like—would need to be curtailed because of financial factors. Third, the discomfort of incapacity may be so depressing in itself as to limit the older person's activities, thus affecting both his motivation and his general attitudes quite severely. When an individual's physical functional capacity is handicapped, his family and friends may tend to be over-protective and fearful, again depressing his attitudes, motivation and activities unless there is a strong compensating factor of resistance and determination. These speculations remain to be tested in future investigations.

SUMMARY

By means of a broad series of intensive interviews and examinations on a biracial group of 251 community volunteers over 60 years of age in North Carolina, it was found that older people with no disability have higher *total* attitude and activity scores than do individuals with mild to severe disability. But whereas all categories of the activity scale are significantly and positively related to physical functional rating except religious activity, the separate categories on the attitude scale are positively but unreliably related to physical functional rating except for attitude toward religion, where an inverse significant relationship was found.

REFERENCES

Cavan, Ruth S., Burgess, E. W., Havighurst, R. J., & Goldhamer, H. *Personal adjustment in old age.* Chicago: Science Research Associates, 1949.

Havighurst, R. J. Validity of the Chicago Attitude Inventory as a measure of personal adjustment in old age. *J. abnorm. soc. Psychol.*, 1951, **46**, 24-29.

Havighurst, R. J., & Albrecht, Ruth. *Older people.* New York: Longmans, Green, 1953.

Institute for Research in Social Science, University of North Carolina. *Recreation for the Aging in North Carolina.* Chapel Hill: The Institute, 1956. Pp. 98-101.

Warner, W. L., Meeker, Marchia, & Eells, K. *Social class in America.* New York: Harper Torchbooks, 1960.

ON AGE AND THE SUBJECTIVE SPEED OF TIME*

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Although the hands of a clock circle the face at the same rate for all observers, time will seem to move more quickly to one person than to another. It is a cultural adage that time seems to go faster if we are busy; slower, if we are idle. But is it being busy, itself, that is the important factor; or is it that being busy may make time more valuable? It is the purpose of this report to question the cultural adage by considering persons whose level of activity has dropped, but for whom the value of time nevertheless has increased. If activity level is the more important factor, then for such persons time should seem more static and slow than before. If the value of time as such is the more important factor, then for such persons time should seem more swift and hasty than before.

In some cases activity and the value of time seem closely related. Kluckhohn (1954) contrasts the dynamic, hasty conception of time found in the urban middle-class American adult with the static, slow conception of time found among the Spanish-Americans in our Southwest. The former individuals are much busier than the latter, much more concerned with getting things done. The need to fill time with various hectic activities makes time more precious and the passage of time more significant for the urban middle-class American than for the Spanish-American. A similar point is made by Hall (1959).

At another level of personality, Knapp and Garbutt (1958) have found that persons high in need for achievement tend to think of time in more swift, hasty terms than do those low in need for achievement. As these investigators point out, the high need achiever's aim is to fill time with as many personal accomplishments as possible, with the result that time has a high value for him. We might well expect such a person to perceive time as more swift and dynamic than does the person lower in achievement need.

Turning to a different case, when a person reaches old age, he tends to become much less active than he was in his prime; he finds himself idle; and even is said to "have time on his hands." The cultural adage of time going more quickly if one is busy would, therefore, lead to the prediction that time should seem more static and slow to an old than to a young person. This prediction, however, is based upon the assumption that a person's activity level, rather than the value of time, is the more important determinant of the subjective speed of time. Yet old age presents a situation where the value of time seems to be greater, even though the aged individual is less busy and active than before. Time is running out for the older person as death approaches. While a minority of old people may be impatiently waiting for death and feel time to be long, the majority probably cleave to life and regret the shortness of the time that remains. For the older individual, then, much time has been used up and little remains. For the younger adult, on the other hand, time is a matter of less concern. He still presumes himself to have a great deal of it, so that as a commodity time is relatively cheap.

If the degree of value of time, rather than a person's level of activity, is the more important determinant of the subjective speed of time, then the prediction would be that time should seem more swift and hasty in old age than in young adulthood. The present experiment evaluates this prediction by determining the extent to which time seems swift or static to older and to younger persons who have been matched as well as possible for education and intelligence.

METHOD

Subjects

A total of 278 persons served as *S*s in the present research: 118 young adults in their freshman or sophomore year of college at the University of Connecticut, and 160 older persons available through The Age Center of New England, Inc., a non-profit gerontological research organization in Boston. The young adults consisted of 48 men and 70 women, while the older persons included 65 men and 95 women. The median age of both the older men

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and older women was 71 years (interquartile range 66 to 74.5 years for the males; 65.5 to 74.5 years for the females). The age range for the young adults, in turn, was approximately 18 to 20.

The median level of education for the older men was 14 years of schooling or the sophomore year of college (interquartile range, 12 to 16 years of schooling); while for older women, the median was 12 years of schooling or the senior year of high school (interquartile range, 12 to 16 years of schooling). The older samples thus were well above the average for their age group in educational level.

The intelligence level of the older samples can be evaluated from their scores on the vocabularly subtest of Wechsler's intelligence test for adults (Wechsler, 1944); a subtest which is highly correlated with the overall score on the Wechsler. While vocabulary scores were not available for all older Ss, for 64 of the 65 older men the median vocabulary score was 36 (interquartile range 32 to 39); for 79 of the 95 older women, the median was 35 (interquartile range 30 to 38). Reports by Dana (1957) and others indicate that these vocabulary scores of our older Ss exceed, if anything, those of college students.

The older Ss, finally, were non-institutionalized, in apparently good physical health, and quite capable of handling the experimental tasks given them. Most of the older males (over 75%) were retired, and very few older persons of either sex had any present family responsibilities.

In sum, the young and older adult samples used in this study probably constitute groups which are quite similar in educational and intellectual status. Both the college students and the older adults were above the population average of their respective age groups regarding education and intelligence.

Procedure

The instrument used was Knapp's time metaphor test (Knapp & Garbutt, 1958), administered individually to older Ss and to small groups of the young Ss. The instructions, printed at the top of the response sheet, were as follows:

> Time is an aspect of our experience of which we are all in some degree and in different ways aware. Below are listed 25 phrases which might be employed by a poet or a writer to symbolize his sense of time. I should like you to read through this list of phrases and then indicate before each how appropriate you think this phrase is in evoking for you a satisfying image of time. First select the five phrases that seem to you most appropriate and before each place the number "1." Then pick out the next five most appropriate phrases and before them place the number "2." Continue this process until you have placed the number "5" before the five least appropriate phrases in your opinion. Please be sure to evaluate these phrases on the basis of how well they express *time* to you rather than on the basis of how pleasing you find them as literary images.

The list of 25 metaphors appeared below these instructions on a single sheet. They were arranged in a random order with regard to meaning. This order, the same as that used by Knapp and Garbutt, is shown by the list numbers in Table 1. Knapp and Garbutt, in their factor analysis of ratings of these metaphors by male college students, obtained one major factor which concerned swift vs. static meanings of time, and no other equally large factor. The first aim in the present study was to replicate Knapp and Garbutt's results concerning this factor with separate factor analyses for young men, for young women, for older men, and for older women. If the factor structure for these four groups proved to be the same and similar to Knapp and Garbutt's, we wished to combine the groups and perform a new factor analysis on all Ss as one group. We then planned to construct individual factor scores for all Ss on the swift-static factor emerging from this combined factor analysis, and to compare young adults and older persons on this dimension.

RESULTS

Factor Analyses and Factor Score Construction

The metaphor ratings were intercorrelated separately for each of the four groups of Ss—young adult males, young adult females, older males, and older females. Each of the four correlation matrices was then factor analyzed by Thurstone's (1947) complete centroid method. The unrotated loadings of the 25 metaphors on the first factor extracted are presented in Table 1.

For the sample of young adult males, the first factor accounts for 25% of the total variance (the next strongest factor accounting for 7%); for young adult females, the first factor accounts for 19% of the variance (the next strongest factor, for 7%); for older males, the first factor accounts for 22% of the variance (the next factor, for 9%); and for older females, the first

factor accounts for 28% of the variance (the next factor, for 8%).

Inspection of the loadings of the various metaphors on this first factor for each of the four groups indicates that the structure of this factor is highly similar for all groups. It is also similar to the first factor reported by Knapp and Garbutt. Its positive end tends to be defined by such metaphors as "a fast-moving shuttle," "a fleeing thief," "a galloping horseman," and "a speeding train." Its negative end tends to be defined by such metaphors as "a quiet, motionless ocean," "a road leading over a hill," "the Rock of Gibraltar," and "a vast expanse of sky." This factor might perhaps best be characterized as "swift vs. static," and is indeed the factor we had hoped would emerge from each of the four analyses. The second factors emerging from each of the four factor analyses were different in structure from group to group, and hence could not provide a basis for group comparisons.

The high degree of similarity of structure of the first factor for all four groups not only is evident from inspection, but is also indicated by the degree of agreement among these four groups in rankings of the metaphors according to their order of magnitude of loading on this first factor. Kendall's coefficient of concordance is .95, thus indicating high agreement (Walker & Lev, 1953).

We then proceeded with the next step: namely, the combining of all 278 Ss in a new factor analysis. The metaphor ratings for all Ss were now intercorrelated and factor analyzed by Thurstone's complete centroid method, with results for the first factor as shown in Table 2. This first factor extracted accounts for 24% of the total variance, the next strongest factor accounting for 6%. As would necessarily be the case, the unrotated loadings in Table 2 for this first factor are highly similar to the analogous loadings in Table 1.

Individual factor scores were constructed for all 278 Ss on this first factor by weighting an S's rating of 1 through 5 for each metaphor by the size of that metaphor's positive or negative loading on the factor. After an S's rating for each metaphor was multiplied by that metaphor's loading on the factor, the 25 products were algebraically summed to yield that S's factor score. (It should be noted that standard deviations of ratings for the various metaphors were highly similar.)

With positive loadings at the swift end of the

TABLE 1. UNROTATED FACTOR LOADINGS OF THE 25 METAPHORS ON THE FIRST FACTOR.

Number on List	Metaphor	Loadings			
		For Young Males	For Young Females	For Older Males	For Older Females
25	a galloping horseman	+83	+56	+71	+68
21	a fleeing thief	+77	+58	+68	+66
7	a fast-moving shuttle	+76	+67	+67	+82
9	a speeding train	+74	+71	+75	+70
2	a whirligig	+66	+47	+51	+71
22	a devouring monster	+49	+17	+33	+46
6	a bird in flight	+35	+25	+51	+44
14	a space ship in flight	+35	+32	+65	+69
13	a dashing waterfall	+32	+55	+33	+52
8	a winding spool	+22	+26	+17	+07
18	marching feet	+22	+37	+11	+19
1	a large revolving wheel	+05	+37	+50	+35
23	a tedious song	−11	−25	−23	−22
15	wind-driven sand	−21	+06	−13	−04
16	an old woman spinning	−24	−27	−14	−20
11	a burning candle	−28	−42	−24	−41
24	a string of beads	−34	−38	−43	−44
4	budding leaves	−36	−29	−35	−53
5	an old man with a staff	−44	−53	−37	−38
17	drifting clouds	−46	−31	−33	−55
12	a stairway leading upward	−52	−48	−34	−50
19	a vast expanse of sky	−54	−61	−70	−76
3	a road leading over a hill	−55	−49	−42	−61
10	a quiet, motionless ocean	−65	−46	−58	−70
20	the Rock of Gibraltar	−72	−41	−51	−43

TABLE 2. UNROTATED FACTOR LOADINGS OF THE 25 METAPHORS ON THE FIRST FACTOR, ARRANGED IN ORDER OF MAGNITUDE OF LOADING, FOR ALL SUBJECTS COMBINED (N = 278).

Number on List	Metaphor	Loading
7	a fast-moving shuttle	+76
9	a speeding train	+74
25	a galloping horseman	+69
21	a fleeing thief	+65
2	a whirligig	+61
14	a space ship in flight	+57
13	a dashing waterfall	+44
6	a bird in flight	+43
22	a devouring monster	+38
1	a large revolving wheel	+31
18	marching feet	+23
8	a winding spool	+16
15	wind-driven sand	−06
23	a tedious song	−18
16	an old woman spinning	−23
11	a burning candle	−36
24	a string of beads	−38
4	budding leaves	−42
5	an old man with a staff	−44
12	a stairway leading upward	−44
17	drifting clouds	−46
20	the Rock of Gibraltar	−50
3	a road leading over a hill	−54
10	a quiet, motionless ocean	−63
19	a vast expanse of sky	−68

factor, and with ratings of 1 given to those metaphors S considered most appropriate as descriptions of time, a positive factor score means that S tended to consider static metaphors more appropriate than swift ones.

Group Comparisons

Table 3 presents median factor scores on this dimension of the swift vs. static meaning of time for male and female younger and older Ss. It is apparent that young adults of each sex tend to consider static metaphors more appropriate than swift ones for describing time, while older persons of each sex tend to consider swift time metaphors more appropriate than static ones.

DISCUSSION

For older individuals, in comparison with younger, level of activity is much reduced but the general value of time is probably higher. The findings hence indicate that the subjective speed of time is more directly influenced by the degree of value of time than by a person's level of activity as such. A first reading of Knapp and Garbutt's findings with respect to need achievement (time seems more swift to high need achievers), as well as the cultural adage (time seems more swift if one is busy), might have led us to expect younger rather than older persons to consider time more swift. If need achievement directly determined the subjective speed of time, this speed should decrease when, as the individual enters old age, former achievement pressures are relaxed. As Knapp and Garbutt themselves point out, however, need achievement's influence on the subjective speed of time is mediated by another factor: the value and significance of time for the individual. The value of time, in turn, may be affected by determinants other than one's need for achievement and how busy or active one is. The present study has pointed to one such additional determinant: the time that has already been used up and the scarcity of time that remains when a human being becomes old.

It also has been noted by Hoagland (personal communication) that the present findings are consistent with what would be expected from the fact that metabolic activity slows down with increasing age (see, e.g., Hoagland, 1943). A slower metabolic rate means that less subjective time will pass per unit of clock time, thus making clock time appear to be "a fleeing thief."

TABLE 3. SWIFT VS. STATIC MEANING OF TIME, BY AGE AND SEX.

	Young adults	Older persons
Median factor scores [a]:		
Males	+3.47	−2.95
Females	+3.05	−1.79
Combined sexes	+3.31	−1.85
Sample *Ns*:		
Males	48	65
Females	70	95
Total	118	160
Mann-Whitney tests of sex differences:		
z	0.69	0.17
p	n. s.	n. s.
Mann-Whitney test of age difference, combined sexes	$z = 4.03$, $p < .0001$	

[a] Negative factor scores indicate preference for swift metaphors.

SUMMARY

In an experiment using 278 older and younger adults of both sexes, it was demonstrated with Knapp's time metaphor test that older persons consider swift metaphors more appropriate for describing time, while young adults consider static metaphors more appropriate. This finding suggests that the subjective speed of time is more directly influenced by the value of time than by a person's level of activity as such, for while activity level decreases in old age, the value of time seems to increase.

REFERENCES

Dana, R. H. A comparison of four verbal subtests on the Wechsler-Bellevue, Form I, and the WAIS. *J. clin. Psychol.*, 1957, **13,** 70-71.

Hall, E. T. *The silent language.* New York: Doubleday, 1959.

Hoagland, H. The chemistry of time. *Sci. Mon.*, 1943, **56,** 56-61.

Kluckhohn, Florence R. Dominant and variant value orientations. In C. Kluckhohn, H. A. Murray, & D. M. Schneider (Eds.), *Personality in nature, society, and culture.* New York: Knopf, 1954. Pp. 342-357.

Knapp, R. H., & Garbutt, J. T. Time imagery and the achievement motive. *J. Pers.*, 1958, **26,** 426-434.

Thurstone, L. L. *Multiple factor analysis.* Chicago: Univer. of Chicago Pr., 1947.

Walker, Helen M., & Lev, J. *Statistical inference.* New York: Holt, 1953.

Wechsler, D. *The measurement of adult intelligence.* Baltimore: Williams & Wilkins, 1944.

ATTITUDES TOWARD OLD PEOPLE: AN EMPIRICAL ANALYSIS OF THE STIMULUS-GROUP VALIDITY OF THE TUCKMAN-LORGE QUESTIONNAIRE*

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Tuckman and Lorge (1953a) have developed a questionnaire meant to measure "attitudes toward old people." The questionnaire consists of 137 statements about old people; the statements are classified into 13 categories: *Conservatism, Activities and Interests, Financial, Physical, Family, Personality Traits, Attitude Toward the Future, Best Time of Life, Insecurity, Mental Deterioration, Sex, Interference,* and *Cleanliness.* Subjects are asked either 1) to indicate by responding "Yes" or "No" whether they agree that a statement is true of old people (Tuckman & Lorge, 1953a) or 2) to indicate the percentage of old people of whom the statement is true (Tuckman & Lorge, 1954). The instrument, and variants of it, have been used to investigate attitudes toward old people as influenced by a graduate course in adult psychology (Tuckman & Lorge, 1952b); by institutionalization (Tuckman & Lorge, 1952a); by the beliefs of the respondents' parents (Tuckman, Lorge, & Spooner, 1953); and by experiences with elderly individuals (Tuckman & Lorge, 1958).

Several issues are raised by the Tuckman-Lorge work. One such issue concerns the minimal requirements of reliability and validity of the scores, since, as with any psychometric instrument, the usefulness of this questionnaire is ultimately contingent upon both. Test-retest reliability coefficients ranging from 0.36 to 0.62, depending upon the age and sex of respondents, are reported for a shorter (40-item) questionnaire consisting of 30 items from the original instrument plus 10 items from a 51-item questionnaire on "attitudes toward older workers" (Tuckman & Lorge, 1952b).

There are at least two types of validity which must be considered. If an attitude toward a group is viewed as a predisposition to act toward members of the group in certain ways, then the ideal demonstration of the first type of validity would be a correlation of scale scores with behaviors toward the group. The relevant question here is, Are attitudes predictive of behavior in "real-life" situations? Thus, a person who agrees with the statement that old people are unproductive would be expected to act differently toward old people from one who disagrees.

Although this kind of validation is extremely difficult to accomplish (since it involves questions of whether, how, and with what transformations expressed attitudes are translated into action), it is of crucial importance both to social theory and to plans for social change. There is, however, a type of validity which is logically prior to the predictive type; this may be called "stimulus-group" validity, a variety of so-called "construct" validity (Technical Recommendations, 1954; Cronbach & Meehl, 1955). The question is now, Do respondents discriminate among groups to which the statements may be applied? For example, if white college students obtain high scores (indicating negative attitudes) when instructed to agree or disagree with stereotypic statements about Negroes, the stimulus-group validity of the questionnaire would not yet have been demonstrated; the case for measurement of specifically anti-Negro attitudes would be incomplete. What also would be required is a demonstration that measured attitudes are less negative toward stimulus groups other than Negroes; that is, that the traits referred to Negroes are not referred to non-Negroes as well.

Stimulus-group validity of scales of attitudes toward ethnic groups is ordinarily tested by determining whether scores are in fact determined by the definition of the stimulus group. With an "attitudes-toward-old-people" scale, such as the Tuckman-Lorge, an unequivocal demonstration of this form of validity would consist in a positive monotonic relationship between scores and age of the group to which the

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statements are referred. Is it the case that a larger number of sterotypic traits are referred to old than to young persons?

The present study was designed to provide a direct test of the stimulus-group validity of the Tuckman-Lorge questionnaire.

PROCEDURE

Two hundred eighty students (170 male, 107 female, 3 with sex unspecified on the response blanks) in three sections of the introductory psychology course at Duke University were given the Tuckman-Lorge questionnaire in dittoed booklet form. The instructions on the first sheet of the questionnaire were identical for all subjects, except that for random fifths of each section, the groups of persons to whom the *Ss* were instructed to apply the statements were 35-year-olds, 45-year-olds, 55-year-olds, 65-year-olds, or 75-year-olds. This design, rather than one requiring each *S* to apply the statements to *each* of the stimulus groups, was adopted in order to avoid unassessable sequence effects. The assumption is that the responses given by *Ss* in different groups represent, uncontaminated by the effects of sequence, the responses that would be given by the same *Ss* referring the statements to each of the stimulus groups.

The instructions to *Ss* for whom the stimulus group was 35-year-olds were as follows:

We are interested in your opinion about people who are about 35 years old. For each of the following statements, check YES if you think it applies to most people who are about 35 years old. Check NO if you think it does not apply to most people of this age.

The questionnaire is so worded that a YES response indicates agreement with the stereotypic statement.

Characteristics of the *Ss* for the various stimulus groups appear in Table 1.

TABLE 1. CHARACTERISTICS OF SUBJECTS COMPLETING THE QUESTIONNAIRE: BY STIMULUS GROUP.

Subjects	Stimulus Groups				
	35	45[a]	55[a]	65	75[a]
Number.....	52	55	58	59	56
Male.....	30	33	38	35	34
Female.....	22	21	19	24	21
Age: Mean.....	19.4	19.4	19.3	19.2	19.3
Range....	18-22	18-23	18-23	18-22	18-22

[a] Sex unknown for one *S*.

RESULTS AND DISCUSSION

Figure 1 shows the mean number of YES responses given to the questionnaire by the *Ss* referring to the five age stimulus groups. The curve is positive and monotonic, the mean number of YES responses increasing with the age of the stimulus group. An analysis of variance yielded a significant treatment effect ($F = 48.94$; $df = 4$ and 275; $p < .01$). The difference between the means for the first two stimulus groups was not significant; the remaining three differences were significant beyond the .01 level under a directional hypothesis.

The Tuckman-Lorge questionnaire as a whole clearly has some degree of stimulus-group validity; scores increase with age of the group to which the statements are referred. In this respect, it appears to satisfy the minimal formal requirement for attitude scales.

The shape of the function in Figure 1 is of interest from another point of view. The dramatic rises occur between 45 and 55, and between 55 and 65; old age (after 35) appears to "begin" sometime between 45 and 55. It is interesting to contrast this result with the reply to the question, asked after the *Ss* had completed the questionnaire proper, "In your opinion, when does old age begin?" Of 280 *Ss*, 194 responded in terms of chronological age, with a mean age of 64.7 years. This is consistent with the responses reported to this query by Tuckman and Lorge (1953b), but this age

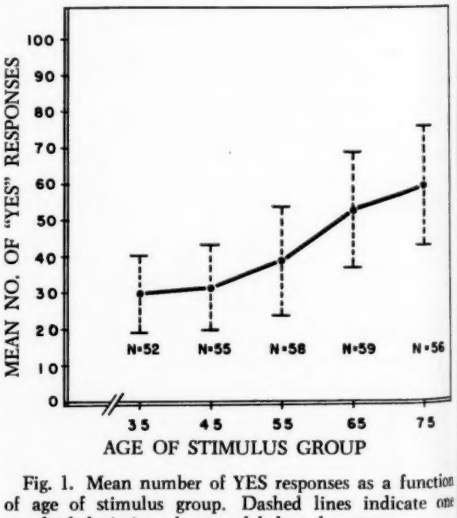

Fig. 1. Mean number of YES responses as a function of age of stimulus group. Dashed lines indicate one standard deviation above and below the mean.

TABLE 2. MEAN PERCENTAGE OF AGREEMENT WITH STEREOTYPE ITEMS FOR ALL STIMULUS GROUPS: PATTERN OF AGREEMENT.

Items	Stimulus Groups					Pattern[a]	φ^{b}
	35	45	55	65	75		
Conservatism (14)							
15. They are set in their ways	58	64	83	86	89	M+	.310
28. They are old fashioned	12	16	40	64	82	M+	.595
42. They are conservative	73	89	85	86	91	N+	.112
45. They are out of step with the times	4	4	12	46	45	N+	.477
46. They like old songs on the radio	71	87	81	80	77	N−	−.012
66. They respect tradition	87	96	97	97	100	M+	.138
73. They hold on to their opinions	73	80	81	97	93	N+	.259
83. They object to women smoking in public	14	18	36	41	66	M+	.389
86. They like to think about the good old days	35	40	57	81	95	M+	.527
94. They prefer old friends rather than to make new ones	33	49	52	61	70	M+	.240
97. They would like to live their lives over again	29	44	38	48	46	N+	.112
106. They are critical of the younger generation	58	56	57	81	70	N+	.201
108. They dislike any changes or interference with the established ways of doing things	23	38	47	75	70	N+	.410
130. They feel that young parents do not know how to bring up children properly	15	35	31	53	48	N+	.258
Activities and Interests (9)							
18. They vote for the political candidate who promises the largest old age pensions	6	0	2	10	7	N+	.126
26. They are more interested in religion	54	55	69	81	82	M+	.300
65. They like religious programs on the radio	17	20	35	64	68	M+	.429
79. They collect many useless things like string, paper, and old shoes	4	4	10	17	32	M+	.288
82. They like to play checkers or dominoes	10	16	29	58	61	M+	.479
96. They spend most of their time reading or listening to the radio	6	11	16	53	66	M+	.540
101. They take a keen interest in politics	81	71	66	63	34	M−	−.279
119. They prefer to read newspapers rather than books	62	46	45	64	61	N+	.101
129. They do not take part in sports	23	58	47	68	71	N+	.202
Financial (6)							
36. They are unproductive	2	4	12	20	21	M+	.277
51. They have too much power in business and politics	8	9	9	7	4	N−	−.061
84. They hide their money	0	2	5	12	27	M+	.300
105. They worry about financial security	77	55	55	73	54	N−	−.010
107. They are tight in money matters	23	13	24	51	59	N+	.384
109. They are usually supported by their children or old age pensions	4	7	10	61	70	M+	.616
Physical (27)							
1. They need glasses to read	46	71	100	97	93	N+	.428
3. They need less food than younger people	65	64	60	51	66	N−	−.072
9. They are poor eaters	4	4	9	20	34	M+	.318
13. They have to be careful of their diet	31	31	67	78	77	N+	.461
16. They need less sleep than younger people	56	56	22	27	29	N−	−.284
22. They have to go to bed early	6	7	22	49	34	N+	.407
27. They have many accidents in the home	8	7	5	39	45	N+	.303
31. They need a nap every day	2	0	16	34	45	N+	.475
35. They feel cold even in warm weather	6	2	12	17	30	N+	.288
40. They never fully recover if they break any bones	2	11	17	36	48	M+	.407
44. They are hard of hearing	2	0	19	46	61	N+	.586
48. They die soon after retirement	2	6	5	7	4	N+	.024
49. They cannot taste differences in food	4	2	7	5	7	N+	.072
64. They have lost most of their teeth	2	4	24	64	77	M+	.696
67. They walk slowly	8	24	35	86	96	M+	.752
72. They suffer from constipation	8	7	24	27	30	N+	.270
76. They spend much time in bed because of illness	0	0	2	17	29	M+	.360
80. They have poor coordination	4	9	28	42	71	M+	.536
87. They feel tired most of the time	2	7	16	25	39	M+	.348
93. Their voices break	2	0	10	24	45	N+	.434
98. They die of cancer or heart disease	12	18	22	32	39	M+	.241
99. They avoid going out in bad weather	25	35	38	78	71	N+	.451
103. They develop infection easily	4	11	22	36	57	M+	.428
110. They are very sensitive to noise	17	16	36	49	36	N+	.284
115. They suffer much discomfort	0	6	9	36	54	M+	.483
122. They have a high automobile accident rate	10	6	16	39	45	N+	.393
131. They die after a major operation	0	0	7	14	16	M+	.285

Table 2—Continued

Items	Stimulus Groups					Pattern[a]	ϕ^b
	35	45	55	65	75		
Family (13)							
5. They spoil their grandchildren	12	42	72	83	64	N+	.470
14. They are proud of their children	96	98	98	97	95	N−	−.027
17. They are not important in family matters	10	2	7	10	25	N+	.172
23. They expect their children to support them	0	2	9	9	23	M+	.269
29. They are a burden to their children	2	0	2	14	16	N+	.258
41. They usually live with their children	62	44	16	31	39	N−	−.171
63. They are good to children	96	95	95	97	93	N−	0
68. They feel that their children have failed them	8	0	17	5	2	N−	0
70. They frequently quarrel with their children and relatives	21	7	10	10	23	N+	.041
81. They get no sympathy from their relatives	6	4	5	10	2	N+	.022
90. They feel that their children neglect them	4	9	14	22	25	M+	.235
116. They expect obedience and respect from their children and grandchildren	81	93	95	92	91	N+	.064
123. They get love and affection from their children	98	89	90	92	86	N−	−.090
Personality (14)							
6. They are kind	85	87	90	95	79	N+	.015
19. They are grouchy	4	6	7	15	14	N+	.167
33. They are calm	79	73	78	73	73	N−	−.034
34. They are hard to get along with	4	0	9	12	25	N+	.267
43. They are very talkative	52	36	64	53	71	N+	.180
47. They are very stubborn	15	11	28	34	38	N+	.267
53. They like to give advice	81	91	93	95	91	N+	.114
54. They make friends easily	94	85	86	80	68	N−	−.208
60. They are touchy	10	11	21	34	45	M+	.337
61. They have few friends	0	2	3	12	18	M+	.258
69. They are selfish	2	0	5	9	9	N+	.184
114. They are cranky	2	2	7	10	20	M+	.233
118. They are bossy	15	4	12	19	23	N+	.168
124. They like to gossip	48	47	52	64	66	N+	.171
Attitude toward Future (5)							
37. They think the world is headed for destruction	4	4	2	10	18	N+	.175
50. They believe in a life after death	77	76	91	88	84	N+	.116
56. They think the future is hopeless	0	0	3	3	9	M+	.176
91. They are afraid of death	17	22	33	17	16	N−	−.039
113. They are anxious about their future	54	38	43	42	29	N−	−.102
Best Time of Life (5)							
4. They are in the happiest period of their life	33	25	21	14	7	M−	−.240
59. They would like to be young again	56	60	79	75	80	N+	.203
62. They never had it better	40	29	17	9	2	M−	−.375
95. They love life	100	89	90	90	73	N−	−.185
137. They have a chance to do all the things they wanted to	35	29	26	27	18	N−	−.101
Insecurity (20)							
10. They get upset easily	6	18	28	39	48	M+	.356
11. They prefer to live alone	4	2	2	5	9	N+	.092
12. They prefer to be alone	0	2	0	0	5	N+	.071
20. They worry about unimportant things	31	31	29	51	63	N+	.262
25. They are easily moved to tears	12	9	9	34	38	N+	.309
30. They feel sorry for themselves	6	6	10	22	36	M+	.303
38. They become insane	0	2	0	0	0	N−	−.071
52. They like to be helped across the street	6	6	16	14	41	N+	.283
55. They are suspicious of others	12	15	26	19	23	N+	.106
57. They worry about their health	25	38	57	95	79	N+	.560
74. They are afraid of the dark	2	0	3	3	9	N+	.136
75. They like to be waited on	27	24	35	31	55	N+	.190
78. They are lonely	2	7	16	46	63	M+	.537
88. They are bad patients when ill	12	2	21	17	32	N+	.235
92. They are fussy about food	17	20	28	37	52	M+	.269
102. They are frequently at loose ends	14	4	10	20	36	N+	.260
125. They feel miserable most of the time	0	2	2	5	14	M÷	.197
133. They are helpless	0	0	0	5	7	M+	.176
134. They are insecure	2	9	9	19	25	M+	.231
135. They have a high suicide rate	6	4	9	0	2	N−	−.117

TABLE 2—CONCLUDED

Items	Stimulus Groups					Pattern[a]	φ^b
	35	45	55	65	75		
Mental Deterioration (14)							
2. They are absent minded	2	4	12	41	45	M+	.475
7. They repeat themselves in conversation	10	15	33	61	66	M+	.536
8. They cannot learn new things	2	9	3	9	11	N+	.074
21. They are better off in old age homes	0	0	0	10	9	N+	.229
24. They are forgetful	4	7	21	58	68	M+	.600
32. They just like to sit and dream	2	4	2	27	36	N+	.373
58. They cannot manage their own affairs	2	0	2	5	21	N+	.235
77. They cannot remember names	4	4	16	25	34	M+	.346
85. They like to doze in a rocking chair	23	18	38	59	70	N+	.435
89. They are in their second childhood	8	7	10	14	20	N+	.136
121. They cannot concentrate even on simple tasks	4	2	2	7	7	N+	.092
127. They become less intelligent	8	7	12	29	43	N+	.338
128. They frequently talk to themselves	4	6	14	31	52	M+	.428
136. They are not useful to themselves or to others	2	4	2	9	0	N+	.027
Sex (4)							
71. They should not marry	4	4	9	27	27	M+	.318
104. They should not become parents	12	29	59	73	82	M+	.560
112. They marry persons much younger than themselves	14	16	19	15	11	N−	−.029
120. They have no interest in the opposite sex	4	2	5	17	29	N+	.297
Interference (3)							
111. They are in the way	4	0	0	9	20	N+	.267
117. They meddle in other people's affairs	6	9	9	27	34	M+	.280
132. They are a nuisance to others	0	0	2	7	9	M+	.204
Cleanliness (3)							
39. They never take a bath	0	0	0	0	5	M+	.123
100. They are untidy and careless about their appearance	4	2	4	5	18	N+	.157
126. They are careless about their table manners	6	0	2	9	20	N+	.197

[a] M - Monotonic: Per cent - YES increases or decreases without inversion from 35-year-old to 75-year-old stimulus groups.
N - Non-monotonic: Per cent - YES - vs - stimulus - group function shows at least one inversion.
+ : Per cent - YES of 107 S_s whose stimulus groups were 35- or 45-year-olds is less than the per cent - YES of 115 S_s whose stimulus groups were 65- or 75-year-olds.
− : Per cent - YES of 107 S_s whose stimulus groups were 35-or 45-year-olds is more than the per cent - YES of 115 S_s whose stimulus groups were 65- or 75-year-olds.

[b] Φ of .132 or more significant at the .05 level; Φ of .173 or more significant at the .01 level.

is later than might have been expected from the clear-cut acceleration in Figure 1 between ages 45 and 55. Answers concerning the "onset" of aging seem to depend in part upon the way in which the questions are asked.

The problem arises of the heterogeneity of the 137 items constituting the questionnaire. Some of the items are doubtless true of larger proportions of old people than of young adults, e.g., *They are hard of hearing*, or *They walk slowly*. Other items are statements of opinion which lack objective validating criteria, e.g., *They worry about unimportant things* (unimportant to whom?), or *They have too much power in business and politics*. An attempt to differentiate these types of items could be made by obtaining the opinions of gerontologists as to which items are true of old people and which are not. An issue here is the relevance of gerontological expertise concerning most of the items. It is unlikely that any expert would say confidently that *Old people are* (or *are not*) *touchy*, or that *They like* (or *do not like*) *to be waited on*. In any case, the essence of a stereotype does not appear to lie in the falsity of a statement or in its applicability to varying proportions of members of stimulus groups, but in the readiness of respondents to agree with a statement concerning most or all members of a stimulus group, without themselves having the relevant information concerning this group. To the extent that respondents consider a statement more applicable to older than to younger stimulus groups, that statement has stimulus-group validity, regardless of its status as true, false, or indeterminate.

The use of the stimulus-group criterion makes possible an item analysis of the Tuckman-Lorge scale and the elimination of those items which do not have stimulus-group validity. The re-

sults of such an item analysis appear in Table 2. The grouping into areas and the numbering of items follow Tuckman and Lorge (1953a). The percentage of *Ss* responding YES is given for each of the five groups. Under *Pattern*, the letter *M* indicates monotonicity (no inversion) of the per cent-YES-*vs.*-stimulus-group curves, and *N* indicates that one or more inversions occurred. The symbols (+) and (−) were assigned as follows: The 107 *Ss* whose stimulus groups were 35- and 45-year-olds were pooled, as were the 115 *Ss* whose stimulus groups were 65- and 75-year-olds; the 55-year-old group was ignored. If the per cent-YES for the first pool (young stimulus groups) was lower than the per cent-YES for the second pool (old stimulus groups), the item was rated (+) to indicate that the difference between the pooled percentages was in the appropriate direction; a difference between the pooled percentages in the inappropriate direction was rated (−). The last column (ϕ) gives the phi coefficient derived from the pooled percentages. (For convenience, ϕs were obtained from Jurgensen's [1947] table; the slight error introduced by unequal *N*s in the pools was ignored. By the chi square test ($\chi^2 = N\phi^2$), a ϕ of 0.132 is significant at the 5 per cent level and a ϕ of 0.173 is significant at the 1 per cent level.

If monotonicity in the expected direction is the criterion for validity of an item, then only 48 of the 137 items are valid, and one of these 48 items (items No. 39 in *Cleanliness*) did not yield a significant ϕ. A less stringent criterion of a (+) rating would yield 115 items, of which 19 did not discriminate significantly between the first and second pools.

Ninety-six of the 137 items, then, have stimulus-group validity by the criterion of a significant (+) rating; responses to the remaining 41 items are either determined by factors other than the age of the stimulus groups or, in the case of significantly (−) items, should be given negative weights. It is likely that a cross-validation would slightly attenuate the number of valid items.

It is suggested that a convenient way to increase precision in investigations using the Tuckman-Lorge questionnaire is to utilize only those items having stimulus-group validity.

SUMMARY

The Tuckman-Lorge questionnaire on attitudes toward old people was administered to a total of 280 college students, divided approximately into random fifths. For each fifth, the questionnaire was identified as eliciting attitudes toward a specific stimulus group: 35-, 45-, 55-, 65-, or 75-year-olds.

The number of stereotypic traits referred to a group increased monotonically with the age of the group. An item analysis indicated that, if the criterion is a significant rise in agreement from *Ss* whose stimulus groups were 35- and 45-year-olds to *Ss* whose stimulus groups were 65-75-year-olds, then 96 of the 137 items are valid. It is suggested that investigators using any scale meant to measure attitudes toward old people consider the stimulus-group validity of its items.

REFERENCES

Cronbach, L. J., & Meehl, P. E. Construct validity in psychological tests. *Psychol. Bull.*, 1955, **52**, 281-302.

Jurgensen, C. E. Table for determining phi coefficients. *Psychometrika*, 1947, **12**, 17-29.

Technical recommendations for psychological tests and diagnostic techniques. *Psychol. Bull. Supplement*, 1954, **51**(2), Part 2, 1-38.

Tuckman, J., & Lorge, I. The effect of institutionalization on attitudes toward old people. *J. abnorm. soc. Psychol.*, 1952, **47**, 337-344. (a)

Tuckman, J., & Lorge, I. The influence of a course in the psychology of the adult on attitudes toward old people and older workers. *J. educ. Psychol.*, 1952, **43**, 400-407. (b)

Tuckman, J., & Lorge, I. Attitudes toward old people. *J. soc. Psychol.*, 1953, **37**, 249-260. (a)

Tuckman, J., & Lorge, I. When does old age begin and a worker become old? *J. Geront.*, 1953, **8**, 483-488. (b)

Tuckman, J., & Lorge, I. The influence of changed directions on stereotypes about aging: before and after instruction. *Educ. psychol. Measmt.*, 1954, **14**, 128-132.

Tuckman, J., & Lorge, I. Attitude toward aging of individuals with experiences with the aged. *J. genet. Psychol.*, 1958, **92**, 199-204.

Tuckman, J., Lorge, I., & Spooner, G. A. The effect of family environment on attitudes toward old people and the older worker. *J. soc. Psychol.*, 1953, **38**, 207-218.

BOOK REVIEWS

Handbook of Social Gerontology: Societal Aspects of Aging. Edited by CLARK TIBBITTS. Chicago: The University of Chicago Press, 1960. Pp. xix + 770. $10.00.

The *Handbook of Social Gerontology: Societal Aspects of Aging,* edited by Clark Tibbitts, is the second of three volumes dealing with the psychological and social aspects of aging and prepared under the auspices of the Inter-University Council in Social Gerontology. The first volume in this series, *Handbook of Aging and the Individual: Psychological and Biological Aspects,* edited by James E. Birren, has already taken its place as a basic reference work in the study of human aging; the present volume will undoubtedly fill a comparable function.

The *Handbook,* the combined efforts of 23 contributors, is divided into three parts: *The Basis and Theory of Social Action; The Impact of Aging on Individual Activities and Social Roles;* and *Aging and the Reorganization of Society.* Like most such compendia, despite the efforts of its editor, the tone of the *Handbook* is uneven. Some chapters emphasize a general review of the topic under consideration; other chapters stress research findings and factual information; still others, where a minimum of research findings are available, stress areas and questions which may be pertinent to future investigations. In general, the component chapters of the *Handbook* reinforce one another. The editor and contributors have been successful in keeping the repetition of data to a minimum—no small task when several chapters by different authors deal with the same basic topics, such as the economic status of the aged, their health status, or their family situation.

Three chapters have been selected for further comment here. The choices are related to the reviewer's beliefs that the present interest in older people in the United States is largely a function of their increased numbers; that a major unresolved problem of the aged is their low economic status and its impact on the American economy; and that, if new roles are to be developed for older people in the United States, these roles must grow out of interpersonal relationships within the family.

In his chapter, "The Changing Demographic Profile," Henry D. Sheldon summarizes the major points made in his earlier and more comprehensive report, *The Older Population of the United States.* After considering the causes of the increase in the numbers and proportions of persons 65 years and over between 1900 and 1950, Sheldon states that while the actual numbers of the aged in the United States will increase in the next several decades, the proportion of older people in the population by the year 2000 will probably be between nine and thirteen per cent, as compared with the present nine per cent. Thus he does not see a flood of aging persons engulfing the United States. Population projections do, however, indicate a sharp rise in the number of older women relative to the number of older men.

Sheldon makes two evaluative statements which bear frequent reiteration: first, that it is important to avoid drawing a sharp line between the aged and non-aged in terms of chronological age alone; and second, that those aged 65 years and over should not be treated as a homogeneous group. ". . . within the population 65 years old and over," says Sheldon, "there are marked gradients with increasing age in such characteristics as labor-force participation, income, sex composition and living arrangements."

Margaret S. Gordon, in her chapter, "Aging and Income Security," carefully reviews recent changes in the economic status of the aged; changes in income, spending and saving through the life cycle; the variations in income within the aged population, and American old age security programs including government programs and private pension plans. Dr. Gordon points out that, although the emergence of poverty as a social problem among the aged has been associated primarily with urbanization, the proportion of families and individuals living in acute poverty in western countries, whether aged or not, has declined greatly in the last sixty years. With the expansion of social insurance programs in the United States during the last decade, the real income status of the aged probably has improved greatly. Despite these hopeful trends, the income of many older persons in the United States is not adequate to maintain life at even subsistence budget levels.

Dr. Gordon has succeeded admirably in the difficult task of evaluating and coordinating masses of data collected at different time-periods, by different agencies and individuals, and by the use of different research methods. One point in her presentation must be commented on, however, since it illustrates some of the difficulties which face the general reader in interpreting much of the descriptive material about the aged population which is now becoming available. In the first paragraph of her report, Dr. Gordon, citing the Census Bureau, says that more than one-sixth of all persons aged 65 years and over had no money income in 1957. However, in Table 10 of her chapter (a table adapted from the authoritative study of the income of the aged by Lenore Epstein of the Social Security Administration), older persons with no money income in 1958, while they total roughly 16 per cent or one-sixth of all aged, are reported in two categories: "Earners' wives not themselves employed," 5.8 per cent of all aged; and "No money income or income solely from other sources" (that is, no income from employment, social insurance and related programs, or from Old Age Assistance), 9.9 per cent. The picture which emerges from Miss Epstein's data is thus more informative and more useful in understanding the aged population than is the summary Census Bureau report.

In "The Older Person in a Family Context," Gordon F. Streib and Wayne E. Thompson present a thoughtful review of research studies dealing with the older person's role in the family, and then supplement their discussion with data from their own studies of older workers. These studies indicate that the present older generation is oriented to a family unit constituted by themselves, their children, and their grandchildren, rather than to the extended family composed of all blood kin. Further, as Streib and Thompson say, "the facts of the case do not seem to square with the popular notions which hold that older parents sit alone and neglected by their children." On the contrary, the relationships between par-

ents and children "meet with approval of the older generation." Older parents see their children often, feel that they can turn to their children for help in case of illness or other crises and, should the situation be reversed, feel that their children can and would turn to them. In general, Streib and Thompson indicate that a realistic appraisal of the family situation of older people in the United States differs markedly from the popular stereotypes on this topic, and that, within the family setting, older people and their children are developing new ways for meeting changing social situations.

The three chapters selected for special consideration in this review, like the *Handbook* itself, make a major contribution to the literature in social gerontology. Serious students in this field are indebted to Clark Tibbitts, his contributors, and to the Inter-University Council in Gerontology.

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BOOKS RECEIVED

BARRON, MILTON L. *The Aging American: An Introduction to Social Gerontology and Geriatrics.* New York: Thomas Y. Crowell, 1961. Pp. xvii + 269. $7.50.

BESKE, FRITZ. *Das Gemeinschaftsleben in Altersheimen.* Stuttgart: Georg Thieme Verlag, 1960. Available from Intercontinental Medical Book Corp., New York. Pp. 122. $3.05. (paper)

BURGESS, ERNEST W., Ed. *Aging in Western Societies: A Comparative Survey.* Chicago: University of Chicago Press, 1960. Pp. xvi + 492. $7.50.

GROOMBRIDGE, BRIAN. *Education and Retirement: An Enquiry Into the Relevance of Education to the Enjoyment of Leisure in Later Life.* London: National Institute of Adult Education (England and Wales), 35 Queen Anne Street, 1960. Pp. 159. 8/6. (paper)

SHOCK, NATHAN W., Ed. *Aging . . . Some Social and Biological Aspects: Symposia Presented at the Chicago Meeting of the American Association for the Advancement of Science, December 29-30, 1959.* AAAS Publ. No. 65. Washington, D. C.: American Association for the Advancement of Science, 1960. Pp. viii + 427.

U. S. DEPT. OF HEALTH, EDUCATION, AND WELFARE. *Selected Articles on Nursing Homes.* Public Health Service Publ. No. 732. Washington, D. C.: U. S. Govt. Print. Off., 1960. Pp. viii + 287. $1.50. (paper)

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A Classified Bibliography of Gerontology and Geriatrics

Edited by
Nathan W. Shock, Ph.D.

INDEX TO CURRENT PERIODICAL LITERATURE

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THE subject categories are those in *A Classified Bibliography of Gerontology and Geriatrics* by Nathan W. Shock published by Stanford University Press, Stanford, California (1951). Only major headings are used and the Roman numerals correspond to those given in the bibliography. In so far as possible, references are classified according to organ systems. Thus, most of the material on Geriatrics will be found under the organ system involved in the disease. Cross references are indicated by number at the end of each section. When available, abstract references are given *(B. A.—Biological Abstracts, P. A.—Psychological Abstracts,* and *P. I.—Population Index)*. Abbreviations for journals are those used in *A World List of Scientific Periodicals Published in the years 1900-1933, 2nd Edition*. For journals not listed, abbreviations were devised according to the general rules used in the above source. It is impossible to cover all journals and list all papers concerned with aging and the aged. Authors and publishers are requested to call attention to publications or to send reprints to the Gerontology Branch, Baltimore City Hospitals. Baltimore 24, Maryland. The assistance of the Forest Park Foundation, Peoria, Illinois, in the preparation of these materials is gratefully acknowledged.

GERONTOLOGY

31260. Alajouanine, T.: Fisiopatologia del rammollimento cerebrale. (Abstract). *Riv. Geront. Geriat., 9:* 144-146, 1960.

31261. Bortz, E. L.: The dual nature of aging. *J. Amer. geriat. Soc., 8:* 753-761, 1960.

31262. Bourlière, F.: Leçon inaugurale. *Rev. franç. Géront., 6:* 213-219, 1960.

31263. Brednow, W.: Die Problematik des Alterns bei Wilhelm v. Humboldt. *Z. Altersforsch., 14:* 89-93, 1960.

31264. Brown, G. W., and M. M. Flood: Tumbler mortality. *J. Amer. statist. Ass., 42:* 562, 1947.

31265. Ciammaichella, S.: II Congresso internazionale di gerontologia. (Nancy-Vittel, giugno 1959). *Riv. Geront. Geriat., 9:* 100-107, 1960.

31266. Cohen, W. J.: Edwin E. Witte (1887-1960); father of social security. *Industr. & Labor Rel. Rev., 14:* 7-9, 1960.

31267. Dal Ri, L.: Quinto Corso di aggiornamento in geriatria della Società Geriatrica Austriaca. *Gior. Geront., 8:* 433-434, 1960.

31268. Everitt, A. V.: The work of Brailsford Robertson, a pioneer experimental gerontologist. *Gerontologia, 4:* 60-75, 1960.

31269. Greppi E.: Société de Gérontologie de Bordeaux et du Sud-Ouest. *Rev. franç. Géront., 6:* 243-245, 1960.

31270. Greppi, E.: *"Fireside conferences." (By the President of the International Association of Gerontology; 1957-1960).* Tito Mattioli, Fidenza, July 1960, 72 pp. (Mimeogr.).

31271. Hirsch, S.: Sur la vraie signification du terme "vieillissement" et sur les rapports entre les branches clinique et biologique de la gérontologie. *Rev. fronç. Géront., 6:* 221-230, 1960.

31272. International Association of Gerontology: *Final program, International Association of Gerontology; Fifth Congress, August 7-12, 1960, San Francisco, California.* The Association, San Francisco, 1960, ix, 235 pp.

31273. Magrot, T.: (Some biophysical and cytological problems in gerontology.) *Plzensky lek. Sborn., 9:* 61-65, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1312, 1960.

31274. Maryland (State of). Coordinating Commission on Problems of the Aging: *Workbook for the Governor's Conference on Aging, University of Maryland, College Park, September 7 and 8, 1960. Factual report on aging in Maryland. Groundwork for our blueprint for the future.* The Commission, Baltimore, Sept. 1, 1960, 80 pp.

31275. Mauriac, P.: Réflexions sur le vieillisseme . et la vieillesse. *Rev. franç. Géront., 6:* 253-255, 1960.

31276. Mazow, B.: Anatomical and physiological changes associated with aging. Chap. 2 *in:* M. J. Hirsch and R. E. Wick (Editors), *Vision of the Aging Patient.* Chilton Co., Philadelphia, 1960, pp. 12-23.

31277. Medawar, P. B.: Old age and natural death. *Mod. Quart., 1:* 30, 1945.

31278. New York. National Social Welfare Assembly. National Committee on Aging. Library: *A general bibliography on aging.* The Library, New York, June 1960, 8 pp.

Published on a grant from the Forest Park Foundation.

31279. Various: Bericht über die Tagung der Deutschen Gesellschaft für Alternsforschung in Hamburg am 26 September 1959. *Z. Altersforsch., 14:* 182-214, 1960.

31280. Various: IX Congresso Nazionale. Firenze, 23, 24, 27 e 28 maggio 1960. *Gior. Geront., 8:* 386-392, 1960.

31281. White House Conference on Aging. Committee on Research in Gerontology; Medical. (Ewald W. Busse, Chairman): *Background paper on research in gerontology; medical.* The Committee, Washington, 1960, 139 pp. (Mimeogr.).

31282. Anonymous: Report on the International Gerontological Congress. *Geriatrics, 15:* 726-729, 1960.

See also No. 31676.

BIOLOGY OF AGING

I. Cellular Biology and Physiology (includes plants)

31283. Buchonova, A. I.: (Cyto- and histological peculiarities of reparative processes in castrates of different age after injection of cortisone and ACTH reports.) *C. R. Acad. Sci. U.R.S.S. (Dokl.), 131:* 461-464, 1960.

31284. Bürger, M.: Die Biomorphose (Alternswandlungen) der elastischen Elemente verschiedener Gewebe (Haut, Lunge und Gefässe). *Z. Altersforsch., 14:* 94-112, 1960.

31285. Duncan, D., D. Nall, and R. Morales: Observations on the fine structure of old age pigment. *J. Geront., 15:* 366-372, 1960.

31286. Osborne, D. J.: Acceleration of abscission by a factor produced in senescent leaves. *Nature, Lond., 176:* 1161-1163, 1955.

31287. O'Steen, W. K., and B. E. Walker: Radioautographic studies of regeneration in the common newt. I. Physiological regeneration. *Anat. Rec., 137:* 501-510, 1960.

31288. Tauchi, H.: On the fundamental morphology of the senile changes. *Nagoya J. med. Sci.,—:* 1-36, 1960.

31289. Vernon, L. P., and W. S. Zaugg: Photoreductions by fresh and aged chloroplasts; requirement for ascorbate and 2,6-dichlorophenolindophenol with aged chloroplasts. *J. biol. Chem., 235:* 2728-2733, 1960.

See also Nos. 31273, 31481, 31487, 31514, 31519.

II. Climate

31290. Loeb, J., and J. H. Northrop: Is there a temperature coefficient for the duration of life? *Proc. nat. Acad. Sci., Wash., 2:* 456-457, 1916.

IV. Longevity

(case reports, drugs, heredity, marriage, occupation, and sex differences)

31291. Arakelian, M. A.: (About selective mortality of male sex of animals.). *Trans. Erevan zootech. vet. Inst., —:* (23), 257-268, 1959.

31292. LaHorgue, J.: Morbidity and marital status. *J. chronic Dis., 12:* 476-498, 1960.

31293. Merrett, J. D.: Social class distribution of respiratory tuberculosis mortality in Northern Ireland, 1949-53. *Brit. J. prev. soc. Med., 13:* 156-161, 1959. Abstr: *P. I., 26:* No. 3155, 1960.

31294. Morris, J. N.: Occupation and coronary heart disease. *Arch. intern. Med., 104:* 903-907, 1959.

31295. Pearl, R.: On a single numerical index of the age of distribution of a population. *Proc. nat. Acad. Sci., Wash., 6:* 427-431, 1920.

31296. Pearl, R.: A note on the inheritance of duration of life in man. *Amer. J. Hyg., 2:* 229-233, 1922.

31297. Pearl, R.: New data on the influence of alcohol on the expectation of life in man. *Amer. J. Hyg., 2:* 463-466, 1922.

31298. Pearl, R.: *Alcohol and mortality.* The Mayflower Press, Plymouth, England, 1922.

31299. Pearl, R.: Duration of life as an index of constitutional fitness. *Poult. Sci., 3:* 1-10, 1923.

31300. Pearl, R.: The influence of alcohol on the duration of life. *Proc. nat. Acad. Sci., Wash., 10:* 231-237, 1924.

31301. Pearl, R., and T. J. LeBlanc: A further note on the age index of a population. *Proc. nat. Acad. Sci., Wash., 8:* 300-303, 1922.

31302. Reeder, L. G.: Occupation and socioeconomic status as variables in heart disease research; a critique. *Amer. J. med. Sci., 238:* 297-307, 1959.

31303. Silcock, H.: The comparison of occupational mortality rates. *Population Stud., 13:* 183-192, 1959.

See also Nos. 31343, 31442, 31531.

IV-C. Longevity: *Comparative Physiology*

31304. Child, C. M.: Age cycles and other periodicities in organisms. *Proc. Amer. phil. Soc., 55:* 330-339, 1916.

31305. Gardner, G., and H. Hurst: Life tables for white leghorn chickens in the state of Utah. *Proc. Utah Acad. Sci., 10:* 149, 1933.

31306. Geiser, S. W.: Notes of the differential death-rate in *Gambusia. Ecology, 2:* 220-222, 1921.

31307. Georgiana, M.: Longevity of the parasitic wasp, *Habrobracon Juglandis* Ashmead. *Amer. Nat., 83:* 39, 1949.

31308. Goetsch, W.: Lebensdauer und geschlechtlige Fortpflanzung bei Hydra. *Biol. Zbl., 42:* 231, 1922.

31309. Hile, R.: Age and growth of the cisco, *Leucichthys artedi* (Le Sueur) in the lakes of the Northeastern Highlands, Wisconsin. *U. S. Bur. Fish. Bull., 19:* 211-317, 1936.

31310. Horrington, E. M., F. Pope, W. Lunsford, and C. M. McCay: Age changes in the bones, blood pressure, and diseases of rats in parabiosis. *Gerontologia, 4:* 21-31, 1960.

31311. James, T. W.: Controlled division synchrony and growth in protozoan microorganisms. *Ann. N. Y. Acad. Sci., 90:* (Art. 2), 550-564, 1960.

31312. Lüth, P.: Lebensdauer und Altern bei den Tieren. *Dtsch. med. J., 11:* 440-443, 1960.

31313. Pearl, R., and J. R. Miner: Life tables for the pecan-nut case bearer. (*Acrobasis caryae* Grote). *Mém. Mus. Hist. nat. Belg., 3:* 169, 1936.

31314. Pearl, R., and S. L. Parker: Experimental studies on the duration of life. III. The effect of successive etherization on the duration of life of Drosophila. *Amer. Nat., 56:* 273-280, 1922.

31315. Pearl, R., and S. L. Parker: Experimental studies on the duration of life. IV. Data on the influence of density of population on duration of life in Drosophila. *Amer. Nat., 56:* 312-321, 1922.

31316. Probst, R. T., and E. L. Cooper: Age, growth and production of the lohr sturgeon *(acipense fulvescens)* in the Lake Winnebago Region, Wisconsin. *Trans. Amer. fish Soc., 84:* 207-227, 1954.

31317. Ricker, W. E.: Natural mortality among Indiana blue-gill sunfish. *Ecology, 26:* 111, 1945.

31318. Schechter, V.: Calcium and magnesium in relation to longevity of Mactra, Neries and Hydroides egg cells. *Biol. Bull. Wood's Hole, 73:* 2, 1937.

31319. Sonneborn, T. M.: The relation of autogamy to senescence and rejuvenescence in *Paramecium aurelia. J. Protozoology, 1:* 38-53, 1954.

31320. Sonneborn, T. M., and M. Rofolko: Aging in the *P. aurelia* multi-micronucleatum complex. *J. Protozoology, 4:* (Suppl.), 21, Aug. 1957.

31321. Terao, A., and T. Tomoxo: Exponential decrease of susceptibility to anaesthesia with age in the water-flea, *moina macrocopa strauss. Proc. imp. Acad., Tokyo, 6:* 208-211, 1930.

31322. Zhu, L. Z., Z. T. Xu, K. P. Huang, I. T. Zhu, and R. Z. Zheung: (Morphological study of aging changes in the rat.) *Chin. J. Zool., 3:* 151-160, 1959.

See also Nos. 31287, 31386, 31387, 31399, 31439, 31465, 31467, 31473, 31474, 31476, 31477, 31491, 31493, 31495, 31505, 31516, 31518, 31519, 31524, 31528, 31529, 31539, 31540, 31608, 31657, 31693.

IV-H. Longevity: *Mortality Rates*

31323. Cyran, W.: (Has cancer mortality really increased?) *Med. Mschr., 13:* 386-388, 1959.

31324. Danaraj, T. J.: Ethnic group differences in coronary heart disease in Singapore; an analysis of necropsy records. *Amer. Heart J., 58:* 516-526, 1959.

31325. Dawber, T. R.: Some factors associated with the development of coronary heart disease—six years' follow-up experience in the Framingham Study. *Amer. J. publ. Hlth., 49:* 1349-1356, 1959. Abstr: *P. I., 26:* No. 3151, 1960.

31326. Dean, G.: Lung cancer among white South Africans. *Brit. med. J., —:* (5156), 852-857, 1959. Abstr: *P. I., 26:* No. 3152, 1960.

31327. Denoix, P. F., and L. Maujol: La mortalité par cancer en France en 1956. *Bull. Inst. nat. Hyg., 13:* 27-57, 1958.

31328. Enterline, P. E., A. E. Rikli, H. I. Sauer, and M. Hyman: Death rates for coronary heart disease in metropolitan and other areas. *Publ. Hlth. Rep., Wash., 75:* 759-766, 1960.

31329. Greppi, E.: La morbidité endogène dans la courbe des âges avancés. *Rev. franç. Géront., 6:* 247-250, 1960.

31330. Kjelsberg, M., and J. Stamler: Epidemiologic studies on cardiovascular-renal diseases. II. Analysis of mortality by age-race-sex-place of residence, including urban-rural comparisons. *J. chronic Dis., 12:* 456-463, 1960.

31331. Ledermann, S.: Structure factorielle des tables de mortalité. *J. Soc. Statist. Paris, 100:* 245-258, 1959.

31332. Mark, H. H.: Mortality among impaired lives. *In: Trends and Differentials in Mortality.* Milbank Mem. Fd., New York, 1956, p. 98.

31333. Metrop. Life Insur. Co.: Mortality higher this year. *Statist. Bull. Metrop. Life Insur. Co., 41:* 9-11, July 1960.

31334. Metrop. Life Insur. Co.: Major aspects of American morbidity. *Statist. Bull. Metrop. Life Insur. Co., 41:* 1-3, Aug. 1960.

31335. Metrop. Life Insur. Co.: Blood pressure level and mortality among women. *Statist. Bull. Metrop. Life Insur. Co., 41:* 3-6, Aug. 1960.

31336. Metrop. Life Insur. Co.: Trends in survival at the older ages. *Statist. Bull. Metrop. Life Insur. Co., 41:* 1-3, Sept. 1960.

31337. New York. Institute of Life Insurance. Division of Statistics and Research: *The historical statistics of life insurance in the United States, 1759 to 1958.* The Division, New York, March 1960, 23 pp.

31338. Pearl, R.: Certain evolutionary aspects of human mortality rates. *Amer. Nat., 54:* Jan., Feb. 1920.

31339. Pearl, R.: A biological classification of the causes of death. *Metron, 1:* 1-8, 1921.

31340. Pearl, R., and M. L. Ilsley: Preliminary discussion of the correlation between illiteracy and mortality in American cities. *Amer. J. Hyg., 2:* 587-600, 1922.

31341. Pearl, R., and L. J. Reed: A life table nomogram. *Amer. J. Hyg., 5:* 330-334, 1925.

31342. Ramharter, F.: Sterbefälle an Krankheiten der Verdauungsorgane in Österreich. *Statist. Nachr., 14:* (12), 508-510, 1959.

31343. Stamler, J., M. Kjelsberg, and Y. Hall: Epidemiologic studies on cardiovascular-renal diseases. I. Analysis of mortality by age-race-sex-occupation. *J. chronic Dis., 12:* 440-455, 1960.

31344. Stamler, J., M. Kjelsberg, Y. Hall, and N. Scotch: Epidemiologic studies on cardiovascular-renal diseases. III. Analysis of mortality by age-sex-nationality. *J. chronic Dis., 12:* 464-475, 1960.

31345. U. S. Department of Health, Education and Welfare. Office of the Secretary. Office of Program Analysis. *Health, education and welfare trends; 1960 edition.* U. S. Govt. Print. Office, Washington, 1960, ix, 90 pp. (Mimeogr.).

31346. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Mortality from each cause; United States, 1956-58. *Vit. Statist., Spec. Rep., Nat. Summaries, 52:* (1), 3-33, 1960.

31347. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Mortality from selected causes; United States and each state, and Alaska, Hawaii, Puerto Rico, and the Virgin Islands (U.S.), 1958. *Vit. Statist., Spec. Rep., Nat. Summaries, 52:* (2), 37-56, 1960.

31348. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Mortality; United States and each state, and Alaska, Hawaii, Puerto Rico, and the Virgin Islands (U.S.), 1958. *Vit. Statist., Spec. Rep., Nat. Summaries, 52:* (3), 59-70, 1960.

31349. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Mortality from selected causes, by age, race, and sex; United States, 1958. *Vit. Statist., Spec. Rep., Nat. Summaries, 52:* (4), 72-109, 1960.

31350. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Maternal mortality; United States and each state, and Alaska, Hawaii, Puerto Rico, and the Virgin Islands (U.S.), 1958. *Vit. Statist., Spec. Rep., Nat. Summaries, 52:* (6), 133-141, 1960.

31351. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Leading causes of death; United States and each state, and Alaska, Hawaii, Puerto Rico, and the Virgin Islands (U.S.), 1958. *Vit. Statist., Spec. Rep., Nat. Summaries, 52:* (7), 145-173, 1960.

31352. U.S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Life tables. Sect. 5 *in: Vital Statistics of the United States 1958.* U.S. Govt. Print. Office, Washington, 1960, pp. 1-6.

31353. U.S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Mortality statistics. Sect. 6 *in: Vital Statistics of the United States 1958.* U.S. Govt. Print. Office, Washington, 1960, pp. 1-46.

31354. Wynder, E. L.: Cancer and coronary artery disease among Seventh-Day Adventists. *Cancer, 12:* 1016-1028, 1959. Abstr: *P. I., 26:* No. 3160, 1960.

See also Nos. 31264, 31290, 31436, 31437.

IV-I. LONGEVITY: *National Groups*

31355. Austria. Bundesministerium für Soziale Verwaltung; and Statistisches Zentralamt: *Bericht über das Gesundheitswesen in Österreich im Jahre 1958.* Bundesministerium, Vienna, 1959, 179 pp.

31356. Austria. Statistisches Zentralamt: Entwicklung der Sterblichkeit in der Republik Österreich. *Beitr. Österreich. Statist., 47:* 1-47, 1960 (processed).

31357. Belgium. Institut National de Statistique: La mortalité et les causes des décès en 1957. *Bull. Statist., 45:* 1401-1422, 1959.

31358. Belgium. Institut National de Statistique: La mortalité et les causes des décès en 1958. *Bull. Statist., 46:* 127-148, 1960.

31359. Belgium. Institut National de Statistique: *Statistique des causes de décès. Année 1957.* The Institut, Brussels, 1959, 98 pp.

31360. Belgium. Ministère de la Santé Publique et de la Famille: *Annuaire statistique de la santé publique 1958.* The Ministere, Brussels, 1959, 239 pp.

31361. Italy. Istituto Centrale di Statistica: *Tavole di mortalità della popolazione italiana 1950-53 e 1954-57.* The Institute, Rome, 1959, 240 pp.

31362. Bourgeois-Pichat, J., and C.-L. Pan: Trends and determinants of mortality in underdeveloped areas. *In: Trends and Differentials in Mortality.* Milbank Memorial Fund, New York, 1956, pp. 11-25.

31363. Burn, A. R.: Hic breve vivitur. *Past & Present, —:* (4), 2-31, 1953. Abstr: *P. I., 26:* No. 3023, 1960.

31364. Candiotti, —., and M. Moine: Etude comparative des décès par maladies cardiovasculaires enregistrées en 1955, en France et dans certains pays étrangers. *Bull. Inst. nat. Hyg., 14:* 829-854, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1458, 1960.

31365. Eberhard, W.: Mobility in South Chinese families. *Sinologica, 6:* 16-24, 1959..

31366. France. Institut National de la Statistique et des Etudes Economiques: *Statistique du mouvement de la population. Année 1952. Première partie. Mariages, divorces, naissances, décès.* The Institut, Paris, 1959, New Series, Vol. XXVI, 225 pp.

31367. Great Britain. Central Statistical Office: Life tables. (i) United Kingdom: life table, 1950-52; life table, 1956-58. (ii) England and Wales: English life table No. 11, 1950-52; life table, 1956-58. (iii) Scotland: Scottish life table, 1950-52; life table, 1956-58. (iv) Northern Ireland: Northern Ireland life table, 1950-52; life table 1956-58. *In: Annual Abstract of Statistics, No. 96.* H. M. Stationery Office, London, 1959, pp. 36-37.

31368. Kučera, M.: (The 1958 abridged life tables.) *Demografie, Prague, 2:* 50-54, 1960.

31369. Lotte, A., and A. Rouillon: Mortalité par tuberculose en France en 1957. Fréquence, suivant l'âge et le sexe, des décès dus aux diverses localizations tuberculeuses et répartition départementale de la mortalité tuberculeuse. *Bull. Inst. nat. Hyg., 14:* 1-29, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1459, 1960.

31370. Luxembourg. Office de la Statistique Générale: Les causes de décès de 1955 à 1958. *Bull. Statist., 10:* 104-110, 1959.

31371. Naddeo, A.: *La mortalità in Italia dopo il 1950.* Istituto di Demografia, Facoltà di Scienze Statistiche Demografiche ed Attauriali, Univ. Roma. Fausto Failli, Rome, 1959, Publ. 3, 32 pp. Abstr: *P. I., 26:* No. 3122, 1960.

31372. Ott, M. W. (Editor): *Bevölkerungsbewegung in der Schweiz 1949-1956/57. Text.* Statistische Quellenwerke der Schweiz, Bern, Switzerland, 1959, Vol. 275, X, 309 pp. Abstr: *P. I., 26:* No. 3062, 1960.

31373. Palermo, Università. Facoltà di Economia e Commercio: Tavole di mortalità della popolazione siciliana 1930-53. *An. Fac. Econ. Com., 21:* 175-204, 1958.

31374. Poland. Glowny Urząd Statystyczny: *(Life table of Poland, 1955/6.)* Warsaw, 1959, 464 pp.

31375. Powell, M.: A century of comparative mortality. *Irish J. med. Sci., —:* (405), 392-400, 1959.

31376. Rhodesia and Nyasaland, Federation of. (Ministry of Health): *Annual report on the public health of the Federation of Rhodesia and Nyasaland for the year 1958, presented to the Federal Assembly 1959.* Govt. Printer, Salisbury, 1959, iii, 36 pp. Abstr: *P. I., 26:* No. 3593, 1960.

31377. Scharnagel, W.: *Untersuchungen über die Sterblichkeit der Bevölkerung von Hof und Umgebung in den Jahren 1600-1820.* The Author, Nüremberg, 1956, ii, 99 pp.

31378. Signorini, L. F.: La composizione per età della popolazione fiorentina in rapporto con alcuni fenomeni demografici e statistico-sanitari. *Riv. ital. igiene, 18:* 456-470, 1958.

31379. Stolnitz, G. J.: Comparison between some recent mortality trends in underdeveloped areas and historical trends in the west. *In: Trends and Differentials in Mortality.* Milbank Memorial Fund, New York, 1956, pp. 26-34.

31380. Sweden. Statistiska Centralbyrån: (Life tables for the year 1957.) *Statist. Tidskrift, 8:* 590-593, 1959. Abstr: *P. I., 26:* No. 3148, 1960.

31381. United Arab Republic (Egypt). Statistical Department: *Vital statistics; births and deaths in localities with health bureaus. Vol. I, 1954.* Govt. Print. Offices, Cairo, 1959, v, XIII, 336 pp. Abstr: *P. I., 26:* No. 3596, 1960.

31382. Vavra, Z.: (Changes in age-specific mortality in the Czech lands, 1870-1944.) *Demografie, Prague, 2:* 37-49, 1960. Abstr: *P. I., 26:* No. 3140, 1960.

31383. Viet-Nam. (National Institute of Statistics): *1958 vital statistics; provisional figures.* The Institute, Saigon, 1959, 29 pp. (processed). Abstr: *P. I., 26:* No. 3591, 1960.

31384. Watanabe, S.: *Old people in transitional Japan with activities of gerontology of Japan and mortality trends in selected countries.* Geront. Ass. Japan, Tokyo, 1960, 70 pp.

31385. World Health Organization. *(Annual epidemiological and vital statistics, 1956.)* The Organization, Geneva, 1959, 705 pp. Abstr: *P. I., 26:* No. 3603, 1960.

V. Metabolism

31386. Friedman, S. M., C. L. Friedman, and M. Nakashima: Effect of Pitressin on old-age changes of salt and water metabolism in the rat. *Amer. J. Physiol., 199:* 35-38, 1960.

31387. Hironaka, R., H. H. Draper, and J. Kastelic: Physiological aspects of aging. III. The influence of aging on calcium metabolism in rats. *J. Nutrit., 71:* 356-360, 1960.

31388. Nikitin, V. N., and R. I. Golubitskaya: (The stimulation by ATP of protein synthesis in liver homogenates during ontogenesis.) *Biokhimia, 24:* 942-944, 1959.

31389. Parhon, C. I., and S. Oeriu: (The role of SH and CH_3 groups in processes of aging.) *Biokhimia, 25:* 61-67, 1960.

31390. Slesareva, Y. N.: (Activity changes of alkaline phosphatase of the bones under the influence of various factors.) *Izv. Timiryazevsk. S.-kh. Akad., 1957:* 145-150, 1957.

31391. Soukupova, K., J. Hrabane, and I. Sindelarova: (Lipid metabolism in old age. Relation to nutrition.) *Acta Univ. carolin., —:* (Suppl. 7), 68-74, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1335, 1960.

31392. Todorov, I. N.: (The age factor in the effect of the pituitary somatotrophic hormone on nucleic acid metabolism.) *Biokhimia, 24:* 930-937, 1959.

VI. Nutrition

31393. Herbeuval, R., —. Porteur, and G. Cuny: Le lait en gériatrie. *Rev. franç. Geront., 6:* 231-240, 1960.

31394. Los Angeles City Schools. Adult School Branch. Franklin Adult School. Gerontology Project: *Old and favorite recipes.* The Project, Los Angeles, 1960, 10 pp.

31395. Olson, R. E.: Diet and coronary artery disease. *Circulation, N. Y., 22:* 453-463, 1960.

31396. Pearl, R., and S. L. Parker: Experimental studies on the duration of life. X. The duration of life of *Drosophila melanogaster* in the complete absence of food. *Amer. Nat., 58:* 193-218, 1924.

31397. Standl, R.: (Enzyme-vitamin therapy of geriatric diseases.) *Med. Klin., 54:* 1436-1437, 1959. See also Nos. 31354, 31391, 31469.

VII. Parental Age

31398. Acsádi, G.: (Weight of infants according to mothers' age.) *Demográfia, Budapest, 2:* 580-586, 1959.

31399. Anorova, N. S.: (The age of parents and posterity of birds.) *Ornitologia,* —: (2), 41-45, 1959.

31400. Comfort, A.: Dependence of the sex ratio at birth on the age of the father. *Nature, Lond., 186:* 1065-1066, 1960.

31401. Lenz, W.: Der Einfluss des Alters der Eltern und der Geburtennummer auf angeborene pathologische Zustände beim Kind. *Acta genet. Statist. med., 9:* 169-201, 1959.

31402. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Natality statistics. Sect. 3 *in: Vital Statistics of the United States 1958.* U. S. Govt. Print. Office, Washington, 1960, pp. 1-36.

31403. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Fetal mortality statistics. Sect. 4 *in: Vital Statistics of the United States 1958.* U. S. Govt. Print. Office, Washington, 1960, pp. 1-14.

31404. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: General characteristics of live births. Sect. 12 *in: Vital Statistics of the United States* 1958. U. S. Govt. Print. Office, Washington, 1960, pp. 237-272.

31405. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Fetal deaths. Sect. 14 *in: Vital Statistics of the United States 1958.* U. S. Govt. Print. Office, Washington, 1960, pp. 327-350.

See also No. 31544.

X. Theories

31406. Alpatov, W. W.: (About longevity.) *Sci. and Life,* —: (2), 31-35, 1960.

31407. Bjorksten, J.: A common denominator in aging research. *Texas Rep. Biol. Med,. 18:* 347-357, 1960.

31408. Conard, R. A.: An attempt to quantify some clinical criteria of aging. *J. Geront., 15:* 358-365, 1960.

See also Nos. 31263, 31271, 31277, 31299.

ORGAN SYSTEMS

I. Blood

31409. Biro, I., and E. Kekes: Observations on changes in the age incidence of acute leukaemia. *Acta med. hung., 14:* 205-209, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1454, 1960.

31410. Levy, L. M., H. Walter, and M. D. Sass: Enzymes and radioactivity in erythrocytes of different ages. *Nature, Lond., 184:* (Suppl. 9), 643-644, 1959. Abstr: *Excerpta Medica,* 3: (Sect. 20), No. 1313, 1960.

See also No. 31519.

I-A. Blood: *Chemistry*

31411. Dilman, V. M.: (The aging hypercholesterolemia as index of activity of hypothalmic centres.) *Ther. Arch., 32:* (2), 72-77, 1960.

31412. Maekawa, T., F. Takaku, K. Hirashima, S. Miwa, and K. Kinugasa: (Haematological studies on the aged. IV. Hb-F content in healthy elderly persons.) *Acta maemat., jap., 22:* (Suppl. I), 199, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1381, 1960.

31413. Morris, T. G.: A comparison of methods for the estimation of serum cholesterol and values in random samples of populations in the 55-64 age group. *J. clin. Path., 12:* 518, 1959. Abstr: *Circulation, N. Y., 22:* 484, 1960.

31414. Ravenni, G., and M. Rubegni: I legami protidocolesterolici nella diagnosi umorale dell'arteriosclerosi. *Gior. Geront., 8:* 401-406, 1960.

31415. Sehra, K. B.: Relationship of socio-economic conditions with blood cholesterol. *Indian J. med. Res., 46:* 743-759, 1958. Abstr: *Excerpta Medica,* 3: (Sect. 20), No. 1341, 1960.

31416. Sevast'yanov, S. I.: (Age determined modifications of some biochemical blood indicators in lambs.) *Trud. Alma-Atinsk. zoovet. Inst., 1956:* (9), 258-264, 1956.

31417. Thomas, C. B.: Degree of obesity and serum cholesterol level. *Science, 131:* 42, 1960. Abstr: *P. I., 26:* No. 3308, 1960.

31418. Toor, M., A. Katchalsky, J. Agmon, and D. Allalouf: Atherosclerosis and related factors in immigrants to Israel. *Circulation, N. Y., 22:* 265-279, 1960.

See also Nos. 31423, 31432, 31468, 31482.

I-B. Blood: *Coagulation*

31419. Ermishina, R. E.: (The influence of novocaine on the blood coagulation in patients of old age.) *Med. J. Urbekistan,* 3: 19-20, 1960.

31420. Geill, T.: The thrombin generation test on plasma. *Gerontologia Clin., 2:* 195-209, 1960.

31421. Kleisch, W. F., P. C. Young, and W. D. Davis, Jr.: Dangers of prolonged anticoagulant therapy in hepatic disease. *J. Amer. med. Ass., 172:* 223, 1960. Abstr: *Circulation, N. Y., 22:* 487, 1960.

III. Cardiovascular System

(blood vessels, blood pressure, hypertension, blood volume, veins, and arteriosclerosis)

31422. Alessio, F.: La trombosi dell'arteria carotide interna. *Gior. Geront., 8:* 393-399, 1960.

31423. Alexander, W. D., A. I. Macdougall, M. F. Oliver, and G. S. Boyd: The effect of salicylate on the serum lipids and lipoproteins in coronary artery disease. *Clin. Sci. 18:* 195, 1959. Abstr: *Circulation, N. Y., 22:* 492, 1960.

31424. Bare, W. W.: Hypertension and edema in the aged. Comparison of hydrochlorothiazide and a hydrochlorothiazide-syrosingopine combination. *J. Amer. geriat. Soc., 8:* 795-802, 1960.

31425. Boyd, A. M.: The natural course of arteriosclerosis of the lower extremities. *Angiology, 2:* 10, Feb. 1960. Abstr: *J. Amer. geriat. Soc., 8:* 810, 1960.

31426. Bruggisser, R., and H. R. Gertsch: Blood pressure in the chronically-ill aged considered statistically. *Cardiologia, 36:* 1-19, 1960.

31427. Casassa, P. M., V. Maccotta, and A. Chiesa: La circolazione periferica nelle persone anziane studiata con la technica dei radio-isotopi (albumina J^{131}). *Gior. Geront., 8:* 407-418, 1960.

31428. Chetchueva, T. A.: (About age changes in venous valves of legs.) *Russk. Arkh. Anat., 38:* 63-74, 1960.

31429. Dotto, B. B.: An all-India survey of normal blood pressure range in males. (A study based on 66,000 subjects between the ages of 0 to 80 years). *Med. Dig., Bombay, 4:* 449-465, 1958.

31430. Elkeles, A.: Calcified atherosclerosis and cancer. *Brit. J. Cancer, 13:* 403-407, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1356, 1960.

31431. Kanabrocki, E. L., I. G. Fels, and E. Kaplan: Cholesterol and collagen levels in human aortas. *J. Geront., 15:* 383-387, 1960.

31432. Kurland, G. S., and A. S. Freedberg: Hormones, cholesterol, and coronary atherosclerosis. *Circulation, N. Y., 22:* 464-473, 1960.

31433. Lisan, P., and S. A. Balaban: Hydrochlorothiazide and syrosingopine in the control of hypertension. *J. Amer. geriat. Soc., 8:* 803-805, 1960.

31434. Lotterhos, W. E.: Evaluation of *Rauwolfia serpentina* with flumethiazide in hypertension. *J. Miss. med. Ass., 1:* 151, 1960. Abstr: *J. Amer. geriat. Soc., 8:* 815, 1960.

31435. Madden, J. L.: Vascular and cardiac trauma. Chap. 18 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 415-454.

31436. Metrop. Life Ins. Co.: Blood pressure level and mortality among men. *Statist. Bull. Metrop. Life Insur. Co., 41:* 1-4, July 1960.

31437. Metrop. Life Insur. Co.: Joint effect of blood pressure level and impairments. *Statist. Bull. Metrop. Life Insur. Co., 41:* 3-6, Sept. 1960.

31438. Miall, W. E.: Follow-up study of arterial pressure in the population of a Welsh mining valley. *Brit. med. J., —:* (5161), 1204-1210, 1959. Abstr: *P. I., 26:* No. 3303, 1960.

31439. Morales, R., D. Duncan, and D. Nall: A note on the fine structure of endothelium in old mice. *Tex. Rep. Biol. Med., 18:* 247-253, 1960.

31440. Riccitelli, M. L., and C. C. Verstandig: The clinical importance of gastro-intestinal gas, especially in relationship to cardiovascular disease. *J. Amer. geriat. Soc., 8:* 806-809, 1960.

31441. Saetti, G. C., F. Guarienti, V. Rubbiani, and G. P. Vecchi: Un metodo poligrafico per lo studio del danno vascolare arterioso. *Gior. Geront., 8:* 305-320, 1960.

31442. Spain, D. M., and V. A. Bradess: Occupational physical activity and the degree of coronary atherosclerosis in "normal" men. A postmortem study. *Circulation, N. Y., 22:* 239-242, 1960.

31443. Stehbens, W. E.: Medial defects of the cerebral arteries of man. *J. Path. Bact., 78:* 179-185, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1311, 1960.

31444. Zelenin, V. F.: *(Disease of cardiovascular system in middle and old age.)* Publishing House of Medical Literature, Moscow, 1959, 235 pp.

31445. Anonymous: L'hypertention artérielle de l'âge sénile. *Rev. franç. Géront., 6:* 361-362, 1960.

See also Nos. 31335, 31364, 31414, 31418, 31469, 31577, 31600.

III-G. Cardiovascular System: *Heart*

(heart, anatomy and physiology, heart disease, coronary artery disease, and myocardial disease)

31446. Buerger, L., and H. Braunstein: Senile cardiac amyloidosis. *Amer. J. Med., 28:* 357, 1960. Abstr: *J. Amer. geriat. Soc., 8:* 810, 1960.

31447. De Arrieta, A.: Les cardipatias valvulares en la vejez y su tratamiento. *Gac. méd. Norte, 9:* 176-180, 1959.

31448. Eiselt, E., and F. Eiseltova: Heart diseases in elderly people. *Acta Univ. carolin., —:* (Suppl. 7), 126-136, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1361, 1960.

31449. Mori, K., and J-P. Duruisseau: Water and electrolyte changes in aging process with special reference to calcium and magnesium in cardiac muscle. *Canad. J. Biochem. Physiol., 38:* 919-928, 1960.

31450. Riabov, K. P.: (Some data about age and age-functional morphology of the heart.) *Sci. Notes Uzhgorod Univ., 32:* 3-18, 1957.

31451. Sova, J., and V. Jezek: (Myocardial infarction in women over 60 years old.) *Acta Univ. carolin., —:* (Suppl. 7), 137-144, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1367, 1960.

31452. Trifonov, A. E.: (Age peculiarities of the heart's capillaries of man.) *Trans. Charkov med. Inst., —:* (18), 29-37, 1959.

31453. Vandeputte, M.: L'athérosclerose coronaire chez les Congolais; etude anatomo-pathologique. *Ann. Soc. belge Méd. trop., 38:* 211-217, 1958. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1353, 1960.

See also Nos. 31395, 31435.

IV. Connective Tissue & Cartilage

31454. Delaunay, A., and S. Bazin: Une expérience fondamentale atteinte in vivo, sous l'effet d'une enzyme des matrices cartilagineuses. *Rev. franç. Géront., 6:* 301-309, 1960.

31455. Koblet, H., and E. H. Frieden: Uptake of glycine-1-C^{14} by connective tissue. III. Effects of adrenal hormones and aging. *Proc. Soc. exp. Biol., N.Y., 104:* 624-627, 1960.

31456. Lagier, R., and B. Exer: Etude de la composition chimique de tissus humains de nature conjonctive en rapport avec l'âge; derme et aponévrose de la paroi abdominale, tendon d'Achille. *Gerontologia, 4:* 39-59, 1960.

31457. Lash, J. W., and M. W. Whitehouse: Variation in the polysaccharide composition of cartilage with age. (Letter to the Editors). *Arch. Biochem., 90:* 159-160, 1960.

See also No. 31598.

V. Endocrine System

(includes sex glands and climacteric)

31458. Adezati, L.: Alcuni aspetti endocrini del diabete presenile e senile. *Gior. Geront., —:* (Suppl. 20), 27-73, 1959.

31459. Antonini, F. M.: Su alcuni aspetti del metabolismo del diabete e delle complicanze vascolari nell'anziano. *Gior. Geront., —:* (Suppl. 20), 77-177, 1959.

31460. Bruinsma, A. H., and F. De Waard: Oestrogenic activity at menopausal age in women with diabetes mellitus ('diabetes gras'). *Acta endocrinol. Kbh., 32:* 233-243, 1959. Abstr: *Biol. Sci., 17:* No. 5499, 1960.

31461. Charvat, J., III: Aging and internal secretions. *Acta Univ. carolin., —:* (Suppl. 7), 37-52, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1346, 1960.

31462. Dorello, U., and G. Azzolini: Alterazioni vascolari retiniche nel diabete senile in rapporto alle condizioni generali. *Gior. Geront., —:* (Suppl. 21), 71-72, 1959.

31463. Eckerström, S.: Studies on senile diabetes. *Gerontologia Clin., 2:* 210-226, 1960.

31464. Greppi, E.: Il diabete degli anziani e dei vecchi in quadro multiplo di patologia eredo-costituzionale tardiva. *Gior. Geront., —:* (Suppl. 20), 5-26, 1959.

31465. Hess, M.: Rat anterior pituitary nucleic acid levels as function of age. *Proc. Soc. exp. Biol., N.Y., 104:* 598-599, 1960.

31466. Koppen, K.: *Die Einflüsse von Alter und Krankheit auf die Ovarien.* Johann Ambrosius Barth, Leipzig, 1957, 76 pp. Abstr: *Z. Altersforsch., 14:* 157, 1960.

31467. Mandl, A. M., and M. Shelton: A quantitative study of oocytes in young and old nulliparous laboratory rats. *J. Endocr., 18:* 444-450, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1306, 1960.

31468. Polosa, P., and L. Mughini: Comportamento dei 17-idrossocorticoidi plasmatici ed urinari e dei 17-chetosteroidi urinari nei diabetici con complicanze vascolari retiniche. *Gior. Geront., —:* (Suppl. 21), 83-85, 1959.

31469. Prostyakov, K. M., A. P. Nesterova, and E. G. Paramonova: (Changes in the functional activity of the thyroid gland in atherosclerosis under the influence of the diet.) *Vop. Pit., 17:* (5), 31-34, 1958. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1348, 1960.

31470. Shevchuk, I. A.: (Age changes in morphology of islet tissue of the pancreas of man.) *Coll. sci. Pap. Chernovizian med. Inst., —:* (10), 285-291, 1959.

31471. Shukurov, M. Sh., (Age hystomorphology of the thyroid gland.) *Coll. Pap. Tashkent Adv. Training Inst. for Doctors, 7:* 247-249, 1959.

31472. Signorelli, S.: Aggiornamenti di terapia del diabete mellito. *Gior. Geront., —:* (Suppl. 20), 181-265, 1959.

31473. Silverstein, E., L. Sokoloff, G. E. Jay, Jr., and O. Mickelsen: Thyroid function, osteoarthritis and epiphyseal closure in various strains of mice. *Amer. J. Physiol., 199:* 209-211, 1960.

31474. Silverstein, E., L. Sokoloff, O. Mickelsen and G. E. Jay, Jr.: Thyroid function in various strains of mice; T/S ratio, PBI and thyroid weight. *Amer. J. Physiol., 199:* 203-208, 1960.

31475. Svechnikova, N. V.: (The use of androgens in the climacteric period.) *Probl. Endokr., Moskva, 5:* 103-107, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1434, 1960.

31476. Thung, P. J.: (The histogenesis of ovarian tumours in mice and in women.) *Jaarboek van Kankeronderzoek en Kankerbestrijding in Nederland,* 1959, pp. 101-118.

31477. Tinyakov, G. G., M. A. Arseneva, and Yu. S. Bocharov: (Age characteristics in the structure of the ape testis, and their reaction to ionizing irradiation.) *Dokl. Akad. Nauk. Armiansk. S.S.S.R., 122:* 799-801, 1958. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1310, 1960.

31478. Wenner, R.: Le ghiandole endocrine nella donna anziana (Abstract). *Riv. Geront. Geriat., 9:* 149, 1960.

See also Nos. 31283, 31386, 31392, 31455, 31521, 31574, 31659.

VI. Gastro-Intestinal Tract

31479. Bercovitz, Z. T.: Ulcerative colitis in older age patients. *Gastroenterology, 39:* 28-33, 1960.

31480. Bercovitz, Z. T.: Ulcerative colitis in older-age patients, diagnosis, differential diagnosis, and treatment. *N. Y. med. J., 60:* 828, 1960. Abstr: *J. Amer. geriat. Soc., 8:* 738-739, 1960.

31481. Emmelot, P., C. J. Bos, P. J. Brombacher and I. H. M. Reyers: Swelling of fresh and aged liver mitochondria as affected by succinate, adenine nucleotides and thyroxine. *Nature, Lond., 186:* 556-558, 1960.

31482. Engelberg, H.: Liver function in patients with elevated serum cholesterol or low-density lipoproteins. *Circulation, N. Y., 22:* 232-238, 1960.

31483. Krapivkin, A. A.: (About age peculiarities of man's rectum.) *Trans. Charkov med. Inst., —:* (51), 13-16, 1959.

31484. Lenczyk, M., W. Chabinka, O. Gedliczka, S. Jasienski, K. Libman, H. Nosek, J. Oszacki, and A. Rodecki: (Statistical analysis of cases of cancer of the stomach treated in Cracow from 1947 to 1956.) *Polsk. Tygod. lek., 14:* 615-618, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1451, 1960.

31485. Lykke-Olesen, O.: *Gastritis in clinically healthy stomachs. A histological study of autopsy material.* The Author (Thesis), Copenhagen, 1960, 232 pp. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1357, 1960.

31486. Podorozhnaia, R. P.: (Age changes of the content of chlorine and calcium in the saliva of the parotid gland of man.) *Trans. Ukrainian Inst. Stomat., —:* (9), 50-62, 1959.

31487. Poliakov, A. A.: (The investigation of the age peculiarities of the tissues of the intestine by means of explantation.) *Sci. Notes Orenburg Div. Allunion Soc., —:* (2), 79-86, 1959.

31488. U.S. Department of Health, Education and Welfare. Public Health Service. Division of Public Health Methods: *Loss of teeth; United States, July 1957-June 1958.* The Division, Washington, Sept. 1960, Series B-22, 26 pp.

31489. Zverev, E. I.: (Chronic dysentery in various age groups.) *Klin. Med., Mosk., 37:* (3), 44-49, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1380, 1960.

See also Nos. 31388, 31421, 31440, 31648.

VII. Kidney

31490. Draper, J. W.: Traumatic lesions of the genitourinary tract. Chap. 15 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 366-384.

31491. Gude, W. D., and A. C. Upton: Spontaneous glomerulosclerosis in aging RF mice. *J. Geront., 15:* 373-376, 1960.

31492. Pacovsky, V., V. Opplova, E. Vitkova, and A. Jeriova, III: (Some problems in the study of the kidney in senescence.) *Acta Univ. carolin., —:* (Suppl. 7), 184-201, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1333, 1960.

See also No. 31636.

VIII. Lymphatic System

31493. Santisteban, G. A.: The influence of age, sex, and the post-operative time interval upon the growth of lymphatic tissue following adrenalectomy in CBA mice. *Anat. Rec., 137:* 407-416, 1960.

IX. Muscular System

31494. Gochblit, I. I., and I. A. Kornienko: (Demarcational head of potentials as a sign of changeable condition of polarization of skeleton muscles in different age periods.) *Bull. exp. Biol. Med., U.S.S.R., 49:* (2), 26-31, 1960.

31495. Ivanov, K. P., and Cu-T. Den: (Electrical activity of muscles and chemical thermoregulation of white rats of different age.) *Sechenov Physiol. J., 46:* 64-70, 1960.

See also No. 31522.

X. Nervous System
(neurology)

31496. Beckenstein, N.: Care and treatment of the senile and arteriosclerotic mental patient. *Dis. nerv. Syst., 20:* (5), 102-105, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1411, 1960.

31497. Bonfiglio, G.: L'istopatologia delle psicosi dell'età senile e presenile. (Proposizioni conclusive). *In: Proceedings of the First International Congress of Neuropathology.* Rosenberg & Sellier, Torino, 1952, Vol. II, pp. 297-311.

31498. Cooper, I. S.: Results of 1,000 consecutive basal ganglia operations for parkinsonism. *Ann. intern. Med., 52:* 483, 1960. Abstr: *J. Amer. geriat. Soc., 8:* 811-812, 1960.

31499. Divry, P.: La pathochimie générale et cellulaire des processus seniles et préséniles. *In: Proceedings of the First International Congress of Neuropathology.* Rosenberg & Sellier, Torino, 1952, Vol. II, pp. 313-345.

31500. Freeman, G. L.: CNS acuity in aging. *Psychol. Rep., 7:* 98, 1960.

31501. German, W. J.: Craniocerebral injuries. Chap. 17 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 401-414.

31502. Gurvich, A. M.: (Respiratory rhythms of EEG and the role of respiratory centre in rebuilding of electrical activity of brain during reexamination (reviving) after clinical death.) *Sechenov Physiol. J., 46:* 434-442, 1960.

31503. Hewer, T. F.: The pathology of cerebral artery occlusion and cerebral ischaemia; a review of recent necropsy material. *Gerontologia Clin., 2:* 241-245, 1960.

31504. Lafora, G. R.: Valorisation critique des découvertes histopathologiques dans la sénilité. *In: Proceedings of the First International Congress of Neuropathology.* Rosenberg & Sellier, Torino, 1952, Vol. II, pp. 471-517.

31505. Manocha, S. L.: Morphological and cytochemical studies on the ageing spinal neurones of the domestic fowl, *Gallus domesticus. Res. Bull. Panjab Univ. Sci., 10:* 343-356, 1959.

31506. Morel, F., and E. Wildi: General and cellular pathochemistry of senile and presenile alterations of the brain. *In: Proceedings of the First International Congress of Neuropathology.* Rosenberg & Sellier, Torino, 1952, Vol. II, pp. 347-374.

31507. Seige, K.: Zur Biomorphose und Biochemie des menschlichen Rückenmarks. II. Untersuchungen der Alternswandlungen des Vorkommens der Gesamtlipoide und Untersuchungen verschiedener Fettfraktionen. *Z. Altersforsch., 14:* 126-147, 1960.

31508. Spatz, H.: La maladie de Pick, les atrophies systematisées progressives et la sénescence cèrebrale prematurée localisée. *In: Proceedings of the First International Congress of Neuropathology.* Rosenberg & Sellier, Torino, 1952, Vol. II, pp. 375-406.

31509. Wahal, K. M., and H. E. Riggs: Changes in the brain associated with senility. *Arch. Neurol. Psychiat., Chicago, 2:* 151, 1960. Abstr: *J. Amer. geriat. Soc., 8:* 750, 1960.

31510. Walter, K.: Die Commotio cerebri am alternden Hirn. *Monographien aus dem Gesamtgebiete der Neurologie und Psychiatrie.* Springer-Verlag, Berlin, 1960, No. 4, 121 pp.

See also Nos. 31285, 31443, 31842.

XI. Reactions of the Body as a Whole

(alergy, anoxia, anesthesia, anthropometry, drugs, exercise, immunity, sleep, and temperature regulation)

31511. Alegría, M., and J. Fernández Cabeza: Consideraciones sobre la estatura de las mujeres españolas actuales. *Antrop. Etnol.*, —: (12), 21-76, 1958.

31512. Allen, T. H., E. C. Anderson, and W. H. Langham: Total body potassium and gross body composition in relation to age. *J. Geront., 15:* 348-357, 1960.

31513. Beliaev, T. G.: (Age peculiarities of development of strength and hardiness.) *Sci. Notes of Permic Pedagogical Inst.*, —: (24), 45-53, 1959.

31514. Bick, E. M.: Wound healing and reparative osteogenesis. Chap. 4 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 64-81.

31515. Delso Blanco, A. E.: La obesidad en el medio rural. *Arch. Fac. Med. Zaragosa, 7:* 469-481, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1457, 1960.

31516. Fábry, P., and Z. Hruza: The effect of age on the ability of rats to adapt to mechanical trauma. *Gerontologia, 4:* 32-38, 1960.

31517. Gibert, H.: Les problèmes de l'anesthésie chez les vieillards. *Rev. franç. Géront., 6:* 311-322, 1960.

31518. Gowen, J. W., and J. Stadler: Life spans of different strains of mice affected by acute irradiation with PKV X-rays. *J. exp. Zool., 132:* 133-155, 1956.

31519. Henshaw, P. S.: Experimental roentgen injury. IV. Effects of repeated small doses of X-rays on blood pictures, tissue morphology, and life span in mice. *J. nat. Cancer Inst., 4:* 513-522, 1944.

31520. Hollingsworth, J. W.: Delayed radiation effects in survivors of the atomic bombings. *New Engl. J. Med., 263:* 481-487, 1960.

31521. Markova, I. V.: (Significance of the pituitary-adrenal system in the sensitivity of animals of different ages to narcotics.) *Bull. exp. Biol. Med., U.S.S.R., 47:* (3), 57, 1959. Abstr: *Biol. Sci., 17:* No. 4947, 1960.

31522. Nöcker, J.: Leistungsfähigkeit und Lebensalter. *Z. Altersforsch., 14:* 189-196, 1960.

31523. Papper, E. M., and L. Brand: Anesthesia. Chap. 3 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 53-63.

31524. Sacher, G. A.: A comparative analysis of radiation lethality in mammals exposed at constant average intensity for the duration of life. *J. nat. Cancer Inst., 15:* 1125-1144, 1955.

31525. Seifert, H.: (Antistreptolysin titer and age. I.) *Z. ges. innere Med., 14:* 641-644, 1959.

31526. Simon, B. E.: Treatment of burns. Chap. 5 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 82-117.

31527. Sweden. Statistiska Centralbyrån: (Measurements of Swedish women.) *Statist. Tidskrift, 9:* 563-565, 1959.

31528. Upton, A. C., A. W. Kimball, J. Furth, K. W. Christenberry, and W. H. Benedict: Some delayed effects of atom-bomb radiations in mice. *Cancer Res., 20:* (Pt. 2), 1-62, 1960.

31529. Upton, A. C., T. T. Odell, Jr., and E. P. Sniffen: Influence of age at time of irradiation on induction of leukemia and ovarian tumors in RF mice. *Proc. Soc. exp. Biol., N. Y., 104:* 769-772, 1960.

31530. Vartia, K. O., and E. Leikola: Serum levels of antibiotics in young and old subjects following administration of dihydrostreptomycin and tetracycline. *J. Geront., 15:* 392-394, 1960.

31531. Warren, S.: Longevity and causes of death from irradiation in physicians. *J. Amer. med. Ass., 162:* 464-467, 1956.

31532. World Health Organization. Expert Committee on Radiation: *First report; effect of radiation on human heredity.* The Committee, Geneva, 1959, Tech. Rept. Series No. 166, 47 pp. Abstr: *P. I., 26:* No. 3416, 1960.

See also Nos. 31321, 31417, 31419, 31442, 31495, 31601.

XII. Reproductive System

(ovaries, testes, See Endocrine System)

31533. France. Institut National de la Statistique et des Etudes Economiques: La situation démographique en 1958. *Étud. Statist., Suppl. Trimestriel Bull. Mens. Statist.*, —: (4), 313-339, 1959. Abstr: *P. I., 26:* No. 3052, 1960.

31534. Freedman, R.: Expected family size and family size values in West Germany. *Population Stud., 13:* 136-150, 1959. Abstr: *P. I., 26:* No. 3198, 1960.

31535. Germany. Federal Republic. Statistisches Bundesamt. (By Karl Schwarz): Die Ursachen der Geburtenzunahme seit 1950. *Wirtsch. u. Stat., 11:* 611-614, 1959. Abstr: *P. I., 26:* No. 3193, 1960.

31536. Gowen, J. W.: Studies in milk secretion. V. On the variations and correlations of milk secretion with age. *Genetics, 5:* 111-188, 1920.

31537. Herschberg, A. D.: A propos des vaginites dites séniles. *Rev. franç. Géront., 6:* 366-368, 1960.

31538. Ireland. Central Statistics Office: *Statistical abstract of Ireland 1959.* Stationery Office, Dublin, 1959, 352 pp. Abstr: *P. I., 26:* No. 3565, 1960.

31539. Olivi, M., I. Paoletti, and G. Sacco: Influenza dei parti sull'incidenza ed età del tumore mammario del topo (R_3, BALB/cf substrains). *Lav. Ist. Anat. Univ. Perugia, 19:* 21-26, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1328, 1960.

31540. Pearl, R.: Fertility and age in the domestic fowl. *Proc. nat. Acad. Sci., Wash., 3:* 354-356, 1917.

31541. Robinson, W. C., and E. H. Robinson: Rural-urban fertility differentials in Mexico. *Amer. sociol. Rev., 25:* 77-81, 1960. Abstr: *P. I., 26:* No. 3204, 1960.

31542. Takebayashi, Y.: Structure of the ligamentum teres uteri at various ages. *Arch. Histol. Jap., 15:* 565-585, 1958. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1307, 1960.

31543. United Nations. Statistical Office: *Demographic yearbook 1959. Eleventh issue. Special topic; natality statistics.* The Office, New York, 1959, Sales No. 59. XIII. 1, 736 pp. Abstr: *P. I., 26:* No. 3602, 1960.

31544. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Live births by age of mother and birth order. Sect. 13 *in: Vital Statistics of the United States 1958.* U. S. Govt. Print. Office, Washington, 1960, pp. 273-324.

31545. Zelikovskaya, Z. Z.: (Age and functional deviations in the structure of the mammary gland.) *Sborn. nauch. trud. L'vovsk. zoovet. Inst., 1956:* (8), 133-142, 1956.

See also Nos. 31402, 31820.

XIII. Respiratory System

31546. Beattie, J. W.: The lungs in old age. II. *Med. Pr., 242:* 296-303, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1373, 1960.

31547. Briscoe, W. A., E. M. Cree, J. Filler, H. E. J. Houssay, and A. Cournand: Lung volume, alveolar ventilation and perfusion interrelationships in chronic pulmonary emphysema. *J. appl. Physiol., 15:* 785-795, 1960.

31548. Fegiz, G., T. Ruggiero, G. Rellini, A. Scabellone, and S. Torriani: Gli aspetti attuali della tubercolosi senile. *Riv. Geront. Geriat., 8:* 91-108, 1959.

31549. Langer, G. A., D. L. Bornstein, and A. P. Fishman: Cardiogenic oscillations in expired nitrogen and regional alveolar hypoventilation. *J. appl. Physiol., 15:* 855-862, 1960.

31550. Permutt, S., and H. B. Martin: Static pressure-volume characteristics of lungs in normal males. *J. appl. Physiol., 15:* 819-825, 1960.

31551. Shao-Ch'ing, W., L. Hua-Teh, and S. T'eng-San: Normal value of residual air and its clinical significance. *Chin. med. J., 77:* 442-451, 1958.

31552. Anonymous: Progres dans la therapeutique des emphysemateux. *Rev. franç. Géront., 6:* 267-268, 1960.

See also Nos. 31284, 31369.

XIV. Sense Organs and Perception

31553. Archer, J. E., and R. S. Eakin: The fitting and adjusting of spectacles for the older patient. Chap. 11 *in:* M. J. Hirsch and R. E. Wick (Editors), *Vision of the Aging Patient.* Chilton Co., Philadelphia, 1960, pp. 202-213.

31554. Auricchio, G., and M. Testa: Sul contenuto in esosamina di cataratte senili nell'uomo. *Rass. ital. Ottalm., 28:* (3-4), 99-101, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1439, 1960.

31555. Barbareschi, G., and A. Zanotto: I melanoblastomi dell'occhio nella senilità. (Studio istopatologico su sette casi bioptici). *Gior. Geront., —:* (Suppl. 21), 63-70, 1959.

31556. Bietti, G.: Rassegna degli aspetti oftalmologici della senescenza. *Gior. Geront., —:* (Suppl. 21), 3-39, 1959.

31557. Ellerbrock, V. J.: Partial vision and optical aids. Chap. 10 *in:* M. J. Hirsch and R. E. Wick (Editors), *Vision of the Aging Patient.* Chilton Co., Philadelphia, 1960, pp. 174-201.

31558. Elliot, A. J.: Lesions of the mascula and perimacular region of involutional and senile origin. *J. Mich. med. Soc., 58:* 2002-2006, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1443, 1960.

31559. Garigali, F., and A. Bonaccorsi: Sulle modificazioni chimiche dell'umore acqueo nelle cataratte senili corticali. *Rass. ital. Ottalm., 28:* 33-43, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1440, 1960.

31560. Hirsch, M. J.: Changes in astigmatism after the age of forty. *Amer. J. Optom., 36:* 395-405, 1959. Asbtr: *Excerpta Medica, 3:* (Sect. 20), No. 1438, 1960.

31561. Hirsch, M. J.: Refractive changes with age. Chap. 5 *in:* M. J. Hirsch and R. E. Wick (Editors), *Vision of the Aging Patient.* Chilton Co., Philadelphia, 1960, pp. 63-82.

31562. Hirsch, M. J.: The bedfast or invalided patient. Chap. 13 *in:* M. J. Hirsch and R. E. Wick (Editors), *Vision of the Aging Patient.* Chilton Co., Philadelphia, 1960, pp. 241-256.

31563. Hirsch, M. J., and R. E. Wick (Editors): *Vision of the aging patient.* Chilton Co., Philadelphia, 1960, xviii, 328 pp.

31564. Kodman, F., Jr., G. Sedlacek, C. Whipple, and T. Lawson: Psychosocial characteristics of adults with functional hearing losses. *Percep. & motor Skills, 11:* 23-27, 1960.

31565. Leydhecker, W., K. Akiyama, and H. G. Neumann: Der intraokuläre Druck gesunder menschlicher Augen. *Klin. Mbl. Augenheilk., 133:* 662-670, 1958. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1437, 1960.

31566. Massimeo, A., and F. Salonna: Alterazioni cocleo-vestibolari nei glaucomatosi. *Riv. oto-neuro-oftal.*, 33: 569-591, 1958. Abstr: *Excerpta Medica*, 3: (Sect. 20), No. 1444, 1960.

31567. Maychuk, Y. F.: (Muscular system of the iris of the human eye and its changes with age.) *Sborn. nauch. trud. Chuvashsk. N-I. Trakhomat. Inst., 1957:* 247-256, 1957.

31568. Miglior, M.: Alcuni aspetti della senescenza del cristallino. *Gior. Geront., —:* (Suppl. 21), 73-75, 1959.

31569. Morgan, M. W.: Anomalies of the visual neuromuscular system of the aging patient and their correction. Chap. 7 *in:* M. J. Hirsch and R. E. Wick (Editors), *Vision of the Aging Patient.* Chilton Co., Philadelphia, 1960, pp. 113-145.

31570. Morgan, M. W.: Accommodative changes in presbyopia and their correction. Chap. 6 *in:* M. J. Hirsch and R. E. Wick (Editors), *Vision of the Aging Patient.* Chilton Co., Philadelphia, 1960, pp. 83-112.

31571. Neill, J. C.: Contact lenses and the older patient. Chap. 14 *in:* M. J. Hirsch and R. E. Wick (Editors), *Vision of the Aging Patient.* Chilton Co., Philadelphia, 1960, pp. 257-263.

31572. Nervi, I., F. Marena, and A. Magnasco: La patologia oculare dell'ultrasessantenne. (Ricerche statistiche sui ricoveri e sulle osservazioni ambulatoriali dal 1934 al 1958). *Gior. Geront., —:* (Suppl. 21), 76-82, 1959.

31573. New York. Health Information Foundation: Changing aspects of blindness. *Progr. hlth. Serv., 9:* (7), 1-6, 1960.

31574. Paufique, L., and P. Guinet: Les hémorragies rétino-vitréennes et la cataracte des états prédiabetiques. *Rev. lyonn. Méd., 6:* 933-939, 1957. Abstr: *Excerpta Medica*, 3: (Sect. 20), No. 1441, 1960.

31575. Pearlman, S. J.: Ageing. *Med. Times, Lond., 87:* 1279-1287, 1959.

31576. Redi, F.: Alcune forme di atrofia iridea nei loro rapporti con la senescenza dell'occhio. *Gior. Geront., —:* (Suppl. 21), 86-88, 1959.

31577. Rubino, A.: Manifestazioni vasculopatiche dell'occhio senile. *Gior. Geront., —:* (Suppl. 21), 43-61, 1959.

31578. Shlaifer, A.: A brief review of the pathology of the eye in age. Chap. 8 *in:* M. J. Hirsch and R. E. Wick (Editors), *Vision of the Aging Patient.* Chilton Co., Philadelphia, 1960, pp. 146-164.

31579. Shlaifer, A.: General pathological phenomena which can affect the vision of the aging patient. Chap. 9 *in:* M. J. Hirsch and R. E. Wick (Editors), *Vision of the Aging Patient.* Chilton Co., Philadelphia, 1960, pp. 165-173.

31580. Suzuki, K.: (Studies on the age changes in hearing acuity.) *J. otorhinolaryng. Soc. Japan, 62:* 2253-2262, 1959. Abstr: *Excerpta Medica*, 3: (Sect. 20), No. 1436, 1960.

31581. Weymouth, F. W.: Effect of age on visual acuity. Chap. 4 *in:* M. J. Hirsch and R. E. Wick (Editors), *Vision of the Aging Patient.* Chilton Co., Philadelphia, 1960, pp. 37-62.

31582. Wick, R. E.: Management of the aging patient in optometric practice. Chap. 12 *in:* M. J. Hirsch and R. E. Wick (Editors), *Vision of the Aging Patient.* Chilton Co., Philadelphia, 1960, pp. 214-240.

See also Nos. 31462, 31630, 31811.

XV. Skeletal System

31583. Bick, E. M., and A. Garcia, Jr.: Dislocations and other traumatic lesions of the joints. Chap. 11 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 267-289.

31584. Daly, J. F., and W. A. Petryshyn: Injuries of the face and neck. Chap. 19 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 455-488.

31585. Garelli, R.: Studio istologico delle modificazioni strutturali della capsula articolare del ginocchio nel corso dell'accrescimento e della senescenza. *Gior. Geront., 8:* 321-375, 1960.

31586. Lackner, J.: (Forestier's disease of the spine.) *Fortschr. Röntgenstr., 91:* 71-76, 1959.

31587. Simon, B. E.: Tendon injuries and hand trauma. Chap. 12 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 290-315.

See also Nos. 31473, 31593, 31594.

XV-A. Skeletal System: *Bone*

31588. Bick, E. M.: Fractures of the extremities. Chap. 6 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 121-182.

31589. Bick, E. M.: Fractures of the vertebrae. Chap. 7 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 183-202.

31590. Caronna, J. P., J. Portela, and A. M. Siragusa: Unilateral dysplasia of bone in an elderly woman. *J. Amer. geriat. Soc., 8:* 778-784, 1960.

31591. Garcia, A., Jr.: Fractures of the pelvis. Chap. 10 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 260-266.

31592. Kulp, J. L., A. R. Schulert, and E. J. Hodges: Strontium-90 in man IV. *Science, 132:* 448-454, 1960.

31593. Lippmann, R. K.: Fractures of the hip. Chap. 8 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 203-242.

31594. Lippmann, R. K.: Fracture dislocations of the hip. Chap. 9 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 243-259.

31595. Murley, A. H. G.: Early weightbearing in the treatment of fractured neck of femur. *Lancet, 1:* (7062), 24-25, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1430, 1960.

31596. Ragolskaja, F. S.: (Age histotopographic changes of parietal bone.) *Coll. Pap. Sverdlovsk Div. Allunion Soc., —:* (2), 91-94, 1959.

31597. Svadkovskii, B. S.: (Age morphology of boneresorption.) *Dokl. Acad. Pedagogical Sci. R.S.F.S.R., —:* (2), 107-110, 1960.

31598. Tonna, E. A., and E. P. Cronkite: Autoradiographic studies of changes in S^{35}-sulfate uptake by the femoral epiphyses during aging. *J. Geront., 15:* 377-382, 1960.

31599. Wylie, R. H.: Trauma to the thorax and rib cage. Chap. 14 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 353-365.

See also Nos. 31390, 31473, 31514.

XVI. Skin and Integument

31600. Gurina, I. G.: (The condition of vascular reactions of man's skin in old age.) *Trans. Karach. sci Skin-Vener. Inst., 6:* 106-114, 1956.

31601. Gurina, I. G.: (The thermoregulation of man's skin in old age.) *Trans. Karach sci. Skin-Vener. Inst., 6:* 94-105, 1959.

31602. Lorincz, A. L.: Physiology of the aging skin. *Illinois med. J., 117:* 59, Feb. 1960. Abstr: *J. Amer. geriat. Soc., 8:* 742, 1960.

31603. Mir-Jachjaeva, B. M.: (Age changes of the man's skin in different parts of the body.) *Coll. Pap. Azerbajdjan med. Inst., 7:* 40-42, 1960.

31604. Oberste-Lehn, H., and A. Nobis: Beobachtungen am Papillarkörper und an dem Haarfollikel während der Alterung des Menschen. *Med. Kosmet., 8:* 176-181, 1959. Abstr: *Excerpta Medica,* 3: (Sect. 20), No. 1446, 1960.

31605. Shair, H. M.: Treatment of the skin of the aged. *Illinois med. J., 117:* 67, Feb. 1960. Abstr: *J. Amer. geriat. Soc., 8:* 747-748, 1960.

31606. Slinger, W. N.: Common skin diseases of the aged. *Illinois med. J., 117:* 63, Feb. 1960. Abstr: *J. Amer. geriat. Soc., 8:* 748-749, 1960.

See also No. 31284.

XVII. Urogenital System
(includes prostate)

31607. Oganesian, K. Ch.: (Age histomorphology of ureters of the man.) *Izv. Akad. Nauk. S.S.S.R. (Ser. Biol.), 12:* (10), 61-69, 1959.

31608. Oganesian, K. Ch.: (Age histomorphology of ureters of the rabbit.) *Izv. Akad. Nauk. S.S.S.R. (Ser. Biol.), 12:* (10), 71-79, 1959.

See also Nos. 31490, 31648.

GERIATRICS

I. General Orientation

31609. Bourlière, F.: (Experimental bases of the correction of disorders of senescence.) *Concours mèd., 81:* 4525-4527, 1959.

31610. Doshi, D. V.: Modern trends in geriatrics. *Curr. med. Pract., 3:* 655-659, 1959.

31611. Westropp, C., and M. Williams: *Health and happiness in old age.* Methuen, London, 1960, 133 pp. Abstr: *Brit. J. Psychol., 51:* 285, 1960.

31612. Woodford-Williams, E.: The clinical medicine of old age. *Proc. nutrit. Soc., 19:* 120-125, 1960.

See also No. 31281.

II. and III. Medical Care and Diagnosis
(medical rehabilitation)

31613. Addams, R.: The role of the nurse in the rehabilitation of the geriatric patient. *Amer. Arch. rehabilit. Ther., 7:* 83-86, 1959. Abstr: *P. A., 34:* No. 3535, 1960.

31614. Alves Guimaraes, J. R.: Consideracoes sobre o emprego de um extrato de tecidos em geriatria. *Arch. Cirurg. clin. exp., 21:* 159-168, 1958. Abstr: *Excerpta Medica,* 3: (Sect. 20), No. 1385, 1960.

31615. Bay, E. B.: The recognition of early illness in the elderly. *Med. Clin. N. Amer., 44:* 275, 1960. Abstr: *J. Amer. geriat. Soc., 8:* 737-738, 1960.

31616. Curry, R. E.: Training for the host-guest relationship in the care of the elderly. *Gerontologia Clin., 2:* 234-240, 1960.

31617. Destrem, H.: Suggestions thérapeutiques pour la prévention du vieillissement. *Rev. franç. Géront., 6:* 261-265, 1960.

31618. Di Macco, G.: Vecchiaia ringiovanimento novocaina. *Rev. Geront. Geriat., 9:* 83-87, 1960.

31619. Dougherty, C. M., and K. McKinney: Medical care of the aging in Baton Rouge. *J. Louisiana med. Soc., 112:* 304-308, 1960.

31620. Fabre, M.: A propos de la thérapeutique gériatrique du Professeur C. I. Parhon. *C. R. Soc. franç. gyn., Paris, 29:* 147-148, 1959. Abstr: *Excerpta Medica,* 3: (Sect. 20), No. 1386, 1960.

31621. Freeman, J. T.: A clinician looks at the commercial home. *Prof. Nurs. Home, 2:* (8), 8-9; 26-27, 1960.

31622. Greeley, O.: *Private nursing homes; their role in the care of the aged.* Publ. Affairs Comm., New York, June 1960, Pamplet No. 298, 20 pp.

31623. Greppi, E., and G. Scardigli: Viaggio gerontologico in Rumania; marzo 1960. *Gior. Geront., 8:* 293-298, 1960.

31624. Guidi, G.: Dalla Clinica al Gerontocomio. *Gior. Geront., 8:* 435-439, 1960.

31625. Harrison, T. R.: Some medical problems in an aging population. *J. med. Ass. Alabama, 29:* 280-283, 1960.

31626. Kennedy, R. H.: The special problem. *In:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 1-9.

31627. Lüth, P.: A review of procaine-therapy in elderly individuals. *J. Geront., 15:* 395-399, 1960.

31628. Nebò, P.: La novocaina in clinica. *Riv. Geront. Geriat., 9:* 88-93, 1960.

31629. Peszczynski, M.: Posttraumatic rehabilitation. Chap. 20 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 491-515.

31630. Rosenbloom, A. A., Jr.: Social and vocational rehabilitation of the blind and partially sighted older patient. Chap. 15 *in:* M. J. Hirsch and R. E. Wick (Editors), *Vision of the Aging Patient.* Chilton Co., Philadelphia, 1960, pp. 264-279.

31631. Schafer, P.: Horizons for rehabilitation of the aging. *Newsletter (Geront. Soc.), 7:* 15-16; 26, 1960.

31632. Smigel, J. O., J. Piller, C. Murphy, C. Lowe, and R. N. Gibson: H-3 (procaine hydrochloride) therapy in aging institutionalized patients; an interim report. *J. Amer. geriat. Soc., 8:* 785-794, 1960.

31633. Sullivan, J. E.: Traumatic shock. Chap. 1 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 13-23.

31634. Sullivan, J. E.: Wounds and other trauma of the abdomen. Chap. 13 *in:* E. M. Bick (Editor), *Trauma in the Aged.* Mc-Graw-Hill Book Co., New York, 1960, pp. 319-352.

31635. Tosberg, W.: The preprosthetic phase of the comprehensive management of the older amputee. *Orthop. prosth. Appl., 13:* 47-51, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1432, 1960.

31636. Trueta, J.: Crush syndrome. Chap. 16 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 387-400.

31637. U. S. Department of Health, Education and Welfare. Public Health Service. Division of Public Health Methods: *Volume of physician visits; United States, July 1957-June 1959.* The Division, Washington, Aug. 1960, Series B-19, 52 pp.

31638. Warren, M. W., and K. E. Vinden: The place of the occupational therapist in the geriatric unit. *Rehabilitation, 29:* 15-19, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1462, 1960.

31639. White House Conference on Aging. Planning Committee on Rehabilitation. (Howard A. Rusk, Chairman): *Background paper on rehabilitation of disabled middle-aged and older people.* The Committee, Washington, April 1960, 54 pp. (Mimeogr.).

31640. Wilson, L. A.: Rehabilitation in the hospital geriatric unit. *Rehabilitation, 25:* 14-18, 1958. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1463, 1960.

31641. Anonymous: Nursing homes roundup. *J. Amer. med. Ass., 169:* 143-149, 1959. Also in *Publ. Aid. Ill., 27:* (8), 1-6, 1960.

See also Nos. 31397, 31424, 31433, 31434, 31472, 31791, 31799, 31801, 31846.

IV. Disease
(chronic, infectious, and mental)

31642. Adler, J.: Tension states in the aged and infirm. *J. Tenn. med. Ass., 53:* 1, 1960. Abstr: *J. Amer. geriat. Soc., 8:* 736-737, 1960.

31643. American Medical Association: Study of chronic illness in Niagara County. *Chron. Ill. News Lett., 11:* (4), Aug. 1960.

31644. Butler, F. S.: The complex nature of cancer. *J. Amer. geriat. Soc., 8:* 689-697, 1960.

31645. California (State of). Department of Public Health: *California's older people—their health problems.* The Department, Berkeley, 1959, 50 pp. (Mimeogr.).

31646. Claveau, M.: Données médicales sur l'état de santé de la population âgée dans le département du Vaucluse. *Rev. franç. Géront., 6:* 327-333, 1960.

31647. Cutler, S. J., F. Ederer, M. H. Griswold, and R. A. Greenberg: Survival of breast-cancer patients in Connecticut, 1935-1954. *J. nat. Cancer Inst., 23:* 1137-1156, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1453, 1960.

31648. De Jager, H.: Prostatic and gastric carcinomata in the aged. *Gerontologia Clin., 2:* 227-234, 1960.

31649. Dickson, R. J., and D. M. R. T. Cantab: Radiotherapy of lethal mid-line granuloma. *J. chronic Dis., 12:* 417-427, 1960.

31650. Goldfarb, A. I.: Psychiatric disorders of the aged; symptomatology, diagnosis and treatment. *J. Amer. geriat. Soc., 8:* 698-707, 1960.

31651. Horwitz, A.: Epidemiologia del cancer en Chile. *Rev. Serv. nac. Salud, Santiago,* 3: (1-2), 5-36, 1958. Abstr: *P. I., 26:* No. 3174, 1960.

31652. Iványi, J., G. Rácz, M. Kozma, and J. Lippai: Erfahrungen an 910 Alterskranken. *Vita Humana, 3:* 83-90, 1960.

31653. Jung, H. D.: (Social-hygienic studies on cancer morbidity in the district of Neubrandenburg in 1953.) *Dtsch. Gesundhwes., 14:* 1111-1126, 1959.

31654. Kaplan, O. J. (Editor): *Mental disorders in later life. Second edition.* Stanford Univ. Press, Stanford, Calif., 1956, 508 pp.

31655. Koltes, J. A., R. A. Matthews, and G. R. Clark: The general practitioner and the aging patient. *Ment. Hosp., 10:* 12-13, Oct. 1959.

31656. Laverriere, J.-P.: De l'hospitalisation dans les hospices et maisons de retraite dans le departement du vaucluse. *Rev. franç. Géront., 6:* 349-355, 1960.

31657. Lipschutz, A., R. Iglesias, G. Rojas, and H. Cerisola: Spontaneous tumourigenesis in aged guinea-pigs. *Brit. J. Cancer, 13:* 468-496, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1325, 1960.

31658. Makari, J. G.: Recent studies in the immunology of cancer. V. Detection of tumors in man by the skin testing of polysaccharide-antibody complexes. *J. Amer. geriat. Soc., 8:* 675-688, 1960.

31659. Meyer, W. J.: Continuous diabetes screening in a rural area. *Publ. Hlth. Rep., Wash., 75:* 784-790, 1960.

31660. New York. Health Information Foundation: Hospitalized mental illness in the U. S. *Progr. hlth. Serv., 9:* (8), 1-8, 1960.

31661. Rambelli, L.: Trattamento dell'ansia, dell'agitazione, dell'eccitamento e della depressione nei soggetti di oltre 60 anni con un nuovo derivato delle fenotiazine; la levomepromazina. *Gior. Geront., 8:* 419-424, 1960.

31662. Rizzente, S., and B. Troccoli: Studio sperimentale sull'azione di un psicotonico in geriatria. *Gazz. int. Med. Chir., 64:* 2433-2446, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1417, 1960.

31663. Schinz, H. R., and Th. Reich: Wandlungen der Karzinomgefährdung in den Vereinigten Staaten von Amerika im Vergleich mit vier europäischen Ländern und Japan. *Oncologia, Basel, 13:* 1-24, 1960. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1449, 1960.

31664. Schreuder, J. T. R.: Old age and cancer. *Gerontologia Clin., 2:* 193-195, 1960.

31665. Schulsinger, F.: (On relief for confused senile patients.) *Mskr. prakt. laegegern., 37:* 394-396, 1959.

31666. Silverman, M., J. B. Parker, and E. W. Busse: A review of drugs in the elderly psychiatric patient. *N. C. med. J., 20:* 428-432, 1959.

31667. Simon, A., M. Fiske, and M. W. Neal: Preliminary report on studies in geriatric mental illness. *Newsletter* (*Geront. Soc.*), *7:* 17-18; 26, 1960.

31668. Sjögren, T., and T. Larsson: The changing age-structure in Sweden and its impact on mental illness. *Bull. World Hlth. Org., 21:* 569-582, 1959. Abstr: *P. I., 26:* No. 3414, 1960.

31669. Thompson, D. J., and A. Ciocco: Sickness, change of residence, and death. I. General results of follow-up in two population groups. *Brit. J. prev. soc. Med., 12:* (4), 172-182, 1958. Abstr: *P. I., 26:* No. 3124, 1960.

31670. Thompson, D. J., and A. Ciocco: Sickness, change of residence, and death. II. Sickness reported in household surveys and subsequent mortality. *Brit. J. prev. soc. Med., 13:* (1), 28-32, 1959. Abstr: *P. I., 26:* No. 3124, 1960.

31671. U. S. Department of Health, Education and Welfare. Public Health Service. Division of Public Health Methods: *Arthritis and rheumatism reported in interviews; United States, July 1957-June 1959.* The Division, Washington, Sept. 1960, Series B-20, 26 pp.

31672. U. S. Department of Health, Education and Welfare. Public Health Service. Division of Public Health Methods: *Diabetes reported in interviews; United States, July 1957-June 1959.* The Division, Washington, Sept. 1960, Series B-21, 22 pp.

31673. U. S. Department of Health, Education and Welfare. Public Health Service. Division of Public Health Methods: *Acute conditions: geographic distribution; United States, July 1958-June 1959.* The Division, Washington, Oct. 1960, Series B-23, 30 pp.

31674. U. S. Department of Health, Education and Welfare. Public Health Service. Division of Public Health Methods: *Older persons—selected health characteristics; United States, July 1957-June 1959.* The Division, Washington, Sept. 1960, Series C-4, 76 pp.

31675. U. S. Senate. Committee on Labor and Public Welfare: *The aged in mental hospitals; a report by the subcommittee on problems of the aged and aging.* 86th Congress, second session. U. S. Govt. Print. Office, Washington, 1960, ii, 5 pp.

See also Nos. 31325, 31330, 31344, 31430, 31444, 31484, 31606, 31637, 31689, 31700, 31792, 31801, 31806.

V. Hygiene

31676. Reynolds, F. W.: Geriatric public health practice. *Geriatrics, 15:* 693-695, 1960.

VIII. Surgery

31677. Bick, E. M. (Editor): *Trauma in the aged.* McGraw-Hill Book Co., New York, 1960, xii, 524 pp.

31678. Debrunner, H.: Orthopädische Altersprobleme. *Medizinische, —:* 2463, 1959. Abstr: *Z. Altersforsch., 14:* 178-180, 1960.

31679. Driscoll, A. C., J. H. Hobika, B. E. Etsten, and S. Proger: Myocardial infarction and other electrocardiographic changes in the postoperative period. *Bull. Tufts-N. Eng. med. Center, 6:* 1, 1960. Abstr: *J. Amer. geriat. Soc., 8:* 813, 1960.

31680. Myers, D., R. A. Winchester, and W. D. Schlosser: Otosclerosis surgery for the older patient. *Geriatrics, 15:* 681-692, 1960.

31681. Naegeli, T.: Beuretilung einiger chirurgisch-geriatrischer Erkrankungen mit besonderer Berücksichtigung von Prophylaxe und Behandlung. *Medizinische, —:* 2460, 1959. Abstr: *Z. Altersforsch., 14:* 176, 1960.

31682. Turco, E.: Considerazioni sui casi di chirurgia geriatrica trattati nel periodo febbraio 1955-giugno 1958. *Minerva anest., Torino, 25:* 290-293; XIII, 1959. Abstr: *Excerpta Medica, 3:* (Sect. 20), No. 1419, 1960.

31683. Wade, P. A., and P. W. Braunstein: Preoperative care and postoperative supportive therapy. Chap. 2 *in:* E. M. Bick (Editor), *Trauma in the Aged.* McGraw-Hill Book Co., New York, 1960, pp. 24-52.

31684. Ziffren, S. E.: *Management of the aged surgical patient.* Year Book Publishers, Chicago, Ill., 1960, 219 pp.

PSYCHOLOGICAL PROCESSES

31685. Bartley, S. H.: Psychological aspects of aging. Chap. 3 *in:* M. J. Hirsch and R. E. Wick (Editors), *Vision of the Aging Patient.* Chilton Co., Philadelphia, 1960, pp. 24-36.

31686. Bouquerel, J.: Psychologie et psychiatrie du vieillard, leurs rapports avec une aide sociale adaptée. *Rev. franç. Géront., 6:* 323-325, 1960.

31687. Boyne, A. W., and J. R. Clark: Secular change in the intelligence of 11-year-old Aberdeen schoolchildren. *Hum. Biol., 31:* 325-333, 1959. Abstr: *P. I., 26:* No. 3309, 1960.

31688. Brüner, H., D. Jovy, and K. E. Klein: Ein objektives Messverfahren zur Feststellung der psychomotorischen Leistungsbereitschaft. *Int. Z. angew. Physiol., 18:* 306-318, 1960.

31689. Busse, E. W.: Problems affecting psychiatric care of the aging. *Geriatrics, 15:* 673-680, 1960.

31690. Cattell, R. B., and R. E. McMichael: Clinical diagnosis by the IPAT music preference test. *J. consult. Psychol., 24:* 333-341, 1960.

31691. Clark, J. A., and G. F. King: Perceptual and motor speed in an extended age group; a factor analysis. *Percep. & motor Skills, 11:* 99-102, 1960.

31692. Dean, L. R.: Aging and the decline of instrumentality. *J. Geront., 15:* 403-407, 1960.

31693. Denenberg, V. H.: Effects of age and early experience upon conditioning in the C57BL/10 mouse. *J. Psychol., 46:* 211-226, 1958. Abstr: *P. A., 34:* No. 2647, 1960.

31694. Graham, F. K., and B. S. Kendall: Memory-for-designs test; revised general manual. *Percep. & motor Skills, 11:* 147-188, 1960.

31695. Gramm, H., and W. Ries: Farbpsychologische Alternsstudien im Lichte der Statistik. *Z. Altersforsch., 14:* 112-126, 1960.

31696. Hirschfeld, A. H.: Treatment of emotional problems in the aging. *J. Mich. med. Soc., 58:* 1447-1450, 1959.

31697. Hudson, A.: Communication problems of the geriatric patient. *J. speech hear. Disord., 25:* 238-248, 1960.

31698. Hügin, F., A. H. Norris, and N. W. Shock: Skin reflex and voluntary reaction times in young and old males. *J. Geront., 15:* 388-391, 1960.

31699. Hunter, W. F.: The psychologist works with the aged individual. *J. counsel. Psychol., 7:* 120-125, 1960.

31700. Inglis, J.: Learning, retention, and conceptual usage in elderly patients with memory disorder. *J. abnorm. (soc.) Psychol., 59:* 210-215, 1959. Abstr: *P. A., 34:* No. 3317, 1960.

31701. Krugman, A. D., S. Ross, F. L. Vicino, and D. J. Clyde: A research note; effects of dextroamphetamine and meprobamate on problem-solving and mood of aged subjects. *J. Geront., 15:* 419-420, 1960.

31702. Levin, R. J.: How old do you think you are? *Today's Hlth., 6:* 22; 43-46, June 1959.

31703. Lüth, P.: Biographie und Altern. *Forsch. Fortschr. dtsch. Wiss., 34:* 238-243, 1960.

31704. Meltzer, H.: Workers' perceptual stereotypes of age differences. *Percep. & motor Skills, 11:* 89, 1960.

31705. Ni, L., and S. Hsiao: A study of mental declination with aging among the retired servicemen tested in Nuan-nuan Center. *Acta psychol. Taiwanica, —:* 9-47, 1958. Abstr: *P. A., 34:* No. 2849, 1960.

31706. Oberg, W.: Age and achievement—and the technical man. *Personnel Psychol., 13:* 245-259, 1960.

31707. Parks, J.: Womanhood after fifty. *Med. Arts Sci., 13:* 68-74, 1959.

31708. Riegel, R. M.: Faktorenanalysen des Hamburg-Wechsler-Intelligenztests für Erwachsene (HAWIE) für die Altersstufen 20-34, 35-49, 50-64 und 65 Jahre und älter. *Diagnostica, 6:* 41-66, 1960.

31709. Rodger, J. R.: Driving and aging. *J. Mich. med. Soc., 58:* 1445-1446, 1959.

31710. Sacerdoti, G., and M. Fagioli: Sul test per l'abilità mentale residua di Williams. Risultati di un gruppo di senili prima e dopo trattamento con 'Cosaldon'. *Folia psychiat. (lecce.), 2:* 175-186, 1959. Abstr: *Excerpta Medica,* 3: (Sect. 20), No. 1413, 1960.

31711. Simon, J. R.: Changes with age in the speed of performance on a dial setting task. *Ergonomics,* 3: 169-174, 1960.

31712. Suci, G. J., M. D. Davidoff, and W. W. Surwillo: Reaction time as a function of stimulus information and age. *J. exp. Psychol., 60:* 242-244, 1960.

31713. Wapner, S., H. Werner, and P. E. Comalli: Perception of part-whole relationships in middle and old age. *J. Geront., 15:* 412-416, 1960.

31714. White, H. L., and A. C. Price: Figure-ground confusion on a test for color blindness as related to impairment on perceptual tests for cortical brain damage. *Percep. & motor Skills, 11:* 131-136, 1960.

31715. Winter, R. E.: Supplementary report on age differences in retention over a twenty-four hour period. *J. Geront., 15:* 417-418, 1960.

SOCIAL AND ECONOMIC ASPECTS

I. Accidents

31716. Acsádi, G.: (Fatal motorcycle accidents in 1958.) *Demográfia, Budapest,* 2: 538-544, 1959. Abstr: *P. I., 26:* No. 3161, 1960.

31717. Iskrant, A. P.: Accident mortality data as epidemiologic indicators. *Amer. J. publ. Hlth., 50:* 161-172, 1960.

31718. Metrop. Life Insur. Co.: Focal points of the motor vehicle accident problem. *Statist. Bull. Metrop. Life Insur. Co., 41:* 6-8, July 1960.

31719. Metrop. Life Insur. Co.: Fatal accidents in later life. *Statist. Bull. Metrop. Life Insur. Co., 41:* 8-10, Sept. 1960.

31720. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Accident fatalities; United States and each state, 1958. *Vit. Statist., Spec. Rep., Nat. Summaries, 52*: (8), 177-208, 1960.

III. Demography

31721. Augière, M.: Les personnes agées dans le department du vaucluse sous le double aspect demographique et social. *Rev. franç. Géront., 6*: 335-348, 1960.

31722. Carroll, S. J., Jr.: The institutionalized population in Minnesota. *Publ. Hlth. Rep., Wash., 75*: 823-826, 1960.

31723. Denmark. Statistiske Departement: (Estimated future population up to 1980, by age.) *Statist. Efterretninger, 51*: 449-454, 1959.

31724. Denmark. Statistiske Departement: (Increase and decrease of population grouped by marital status and age in 1957.) *Statist. Efterretninger, 51*: 454-455, 1959.

31725. Denmark. Statistiske Departement: (Concerning the population of the Faeroe Islands.) *Statist. meddelelser, Copenhagen, 173*: (3), 1-40, 1959. Abstr: *P. I., 26*: No. 3554, 1960.

31726. Fischlowitz, E.: Correlação entre a política social e a demográfica. *Rev. Serv. espec. Saúde Públ., 84*: 117-131, 1959. Abstr: *P. I., 26*: No. 3417, 1960.

31727. George, P.: *Questions de géographie de la population.* Inst. Nat. d'Etudes Démogr., Trav. Doc. No. 34, Pr. Univ. de France, Paris, 1959, 229 pp. Abstr: *P. I., 26*: No. 3005, 1960.

31728. Germany. Berlin (West). Statistisches Landesamt: Bevölkerungsvorgänge in Berlin (West) im Jahre 1957. *Berl. Statist., —:* (Suppl. 76), 1-79, Jan. 1960 (processed). Abstr: *P. I., 26*: No. 3562, 1960.

31729. Germany. Federal Republic. Statistisches Bundesamt: *Die voraussichtliche Bevölkerungsentwicklung bis 1975 nach Geschlecht und Alter.* Statist. Berichte, VIII/7/80, March 26, 1959, 11 pp.

31730. Great Britain. National Old People's Welfare Council: *Annual report for the year ending 31st March, 1960.* The Council, London, 1960, 49 pp.

31731. Hofstetter, H. W.: General introduction. Chap. 1 *in*: M. J. Hirsch and R. E. Wick (Editors), *Vision of the Aging Patient.* Chilton Co., Philadelphia, 1960, pp. 1-11.

31732. Italy. Istituto Centrale di Statistica: *Annuario di statistiche demografiche 1957.* The Istituto, Rome, 1959, 434 pp.

31733. Korea. Ministry of Home Affairs. Bureau of Statistics: *Statistical yearbook of the Republic of Korea 1957.* The Bureau, Seoul, 1958, vi, 466 pp. Abstr: *P. I., 26*: No. 3587, 1960.

31734. McArthur, N.: *The populations of the Pacific Islands.* Dept. of Demography, Australian Nat. Univ., Canberra, 1955, 616 pp. (processed). Abstr: *P. I., 26*: No. 3011, 1960.

31735. Malta. Central Office of Statistics: *Population, housing and employment census of the Maltese Islands, November 1958. Preliminary report.* The Office, Valletta, Jan. 1958, iv, 37 pp. Abstr: *P. I., 26*: No. 3573, 1960.

31736. Malta. Central Office of Statistics: *Census 1957, the Maltese Islands. Report on population and housing.* The Office, Valletta, 1959, xcviii, 276 pp. Abstr: *P. I., 26*: No. 3571, 1960.

31737. Mulligan, L. C.: The growth and aging of population. *J. statist. soc. Inquiry, 20*: 1-21, 1958-59. Abstr: *P. I., 26*: No. 3012, 1960.

31738. New York (State of). Department of Health. Office of Statistical Services and Research: *Basic vital statistics, New York State (exclusive of New York City), 1900-1958.* The Office, Albany, 1959, 37 pp.

31739. Njegic, R.: (Age structure and the main age classes.) *In*: (*Second Demographic Seminar, May 29-June 8, 1956.*) Belgrade, Nov. 1957, pp. 59-71 (processed).

31740. Paraguay. Dirección General de Estadística y Censos: Edad en años simples de la población del Paraguay por zonas urbana y rural según sexo, 1950. *Bol. Estad. Paraguay, 2*: (4-5), 8-9, 1958.

31741. Paraguay. Dirección General de Estadística y Censos: Edad en grupos quinquenales de la población total urbana y rural, según sexo por departamentos. *Bol. Estad. Paraguay, 2*: (7-8), 10, 1958.

31742. Saunders, J. V. D.: *La poblacion del Ecuador. Un análisis del censo de 1950.* Casa de la Cultura Ecuatoriana, Quito, 1959, 114 pp.

31743. Spain. Instituto Balmes de Sociologia: *Estudios demograficas, Vol. IV.* The Instituto, Madrid, 1959, 596 pp. Abstr: *P. I., 26*: No. 3019, 1960.

31744. U. S. Department of Health, Education and Welfare. Special Staff on Aging: *The aging population; national totals, 1959.* U. S. Govt. Print. Office, Washington, Revised March 1960, Fact Sheet No. 1, 4 pp. (Mimeogr.).

31745. U.S.S.R. TSentral'noe Statisticheskoe Upravlenie: (*Concerning the education level, national composition, and growth structure of the population of the U.S.S.R. according to data of the All-Union population census of 1959.*) Tipografia No. 12, Moscow, Gossta izdat, Feb. 4, 1960, 19 pp. Abstr: *P. I. 26:* No. 3582, 1960. Also in *Soviet News, —:* (4211), 137-141, Feb. 11, 1960.

31746. Viet-Nam. Secrétariat d'Etat à l'Economie Nationale. Institut National de la Statistique: *Recensement pilote de la province de Phuoc-Tuy effectué le 6 novembre 1959.* The Institut, Saigon, no date, X, 68 pp. (processed). Abstr: *P. I., 26*: No. 3590, 1960.

31747. Vogelnik, D.: (A projection of population trends in Slovenia for the years 1953-1963.) *Ekonomski Zborn.*, 3: 213-226, 1958.

31748. von Ungern-Sternberg, R.: Die neuesten Vorgänge in der Bevölkerungsbewegung der wichtigsten Länder der Erde. *Jb. Natökon. Stuttgart, 171*: 402-421, 1959.

31749. Wisconsin State Board of Health. Division of Chronic Disease and Aging: *Fact book on Wisconsin's aging population.* The Division, Madison, 1960, 68 pp.

31750. You Poh Seng,—.: Errors in age reporting in statistically underdeveloped countries (with special reference to the Chinese population of Singapore). *Population Stud., 13:* 164-182, 1959. Abstr: *P. I., 26:* No. 3501, 1960.

31751. Anonymous: Surinam; present demographic position. *Vox Guyanae,* 3: (3), 97-128, 1959. Abstr: *P. I., 26:* No. 3065, 1960.

See also Nos. 31776, 31805, 31828.

IV. Economic Problems

31752. White House Conference on Aging. Planning Committee on Income Maintenance. (Charles I. Schottland, Chairman): *Background paper on income maintenance.* The Committee, Washington, June 1960, 110 pp. (Mimeogr.).

See also No. 31821.

IV-B Economic Problems: *Employment*

31753. Amon, F.: Leistungsstarkes hohes und lebenswertes höchstes Lebensalter. z. *ärztl. Fortbild.,* 53: 1175-1178, 1959. Abstr: *Excerpta Medica,* 3: (Sect. 20), No. 1469, 1960.

31754. Canada. Department of Labour. Economics and Research Branch: *Aging worker in the Canadian economy.* The Branch, Ottawa, July 1959, 61 pp. Abstr: *P. I., 26:* No. 3359, 1960.

31755. Chaigneau, Y.: Evolution de l'emploi aux Etats-Unis. *Rev. Econ. franç., 11:* 107-129, 1960.

31756. Dowd, G. C., H. Brandaleone, W. P. Eckes, and D. H. Goldstein: Panel discussion on problems of the aged in industry. *J. Amer. geriat. Soc., 8:* 762-777, 1960.

31757. Germany. Berlin (West). Statistisches Landesamt: Die am Erwerbsleben beteiligte Bevölkerung in Berlin (West) 1958. Ergebnisse des Mikrozensus im Oktober 1958. *Berl. statist. Mschr., 14:* 5-15, 1960.

31758. Lopez Valencia, F.: Qué hacer de los viejos? Ensayo de gerontología laboral. *Rev. Trabajo, 21:* (2), 11-33, 1959. Abstr: *P. I., 26:* No. 3388, 1960.

31759. Luxembourg. Office de la Statistique Générale: Recensement agricole du 15 mai 1959. *Bull. Statist., 10:* 314-321, 1959.

31760. Malta. Central Office of Statistics: *Census 1957, the Maltese Islands. Report on economic activities.* The Office, Valletta, 1959, cvii, 318 pp. Abstr: *P. I., 26:* No. 3570, 1960.

31761. Netherlands. Departement van Sociale Zaken en Volksgezondheid: (*Interim report concerning the work of older people. Issue by a departmental work group.*) The Departement, The Hague, 1958, 45 pp.

31762. New York (State of). University. State Education Department. Pupil Personnel Services and Adult Education. Bureau of Adult Education: *That extra dollar in later life; four courses of study.* The Bureau, Albany, 1958, 123 pp.

31763. U. S. Department of Health, Education and Welfare. Social Security Administration: *Employer attachment in four selected firms.* Bur. Old-Age & Surv. Insur., Div. Prog. Anal., Aug. 1960, Anal. Note No. 113, 6 pp.

31764. U. S. Department of Health, Education and Welfare. Social Security Administration: *Employment of women under the Old-Age, Survivors, and Disability Insurance Program.* Bur. Old-Age & Surv. Insur., Div. Prog. Anal., Anal. Note No. 114, 1-18, Sept. 1960 (Mimeogr.).

31765. U. S. Department of Health, Education and Welfare. Social Security Administration: Quarterly summary of earnings, employment and benefit data. *Bur. Old Age & Surv. Insur., Div. Prog. Anal., 20:* 1-24, Sept. 1960.

31766. Wermel, M. T., and G. M. Beideman (Editors): *Industry's interest in the older worker and the retired employee. Proceedings of a conference.* Benefits & Insur. Res. Center, Industr. Rel. Sec., Calif. Inst. Tech., Pasadena, May 1960, Publ. No. 13, viii, 35 pp.

31767. White House Conference on Aging. Committee on Employment Security and Retirement. (Dwight S. Sargent, Chairman): *Background paper on the employment security and retirement of the older worker.* The Committee, Washington, July 1960, 73 pp. (Mimeogr.).

31768. Anonymous: The aging worker in the Canadian economy; recent studies on employment problems of older workers. *Industr. Labour,* 23: 353-356, 1960.

31769. Anonymous: The "aged"—management's dilemma. *Off. Mgmt., 21:* (1), 35-37; 175-178, 1960.

See also Nos. 31345, 31704, 31735.

IV-C. Economic Problems: *Retirement and Pensions*
(See also Social Security)

31770. Levine, A. J.: Our senior citizens go into retirement. *Jewish Forum,—:* 2-4, July 1960.

31771. New York (State of). University. State Education Department. Pupil Personnel Services and Adult Education. Bureau of Adult Education: *Retirement—a second career.* The Bureau, Albany, no date, 70 pp.

31772. Odell, C. R.: The role of labor in retirement preparation education. *Adult Leadership, 9:* 15; 31-33, May 1960.

31773. U. S. Congress. Senate. Committee on Finance: *Self-Employed Individuals' Retirement Act of 1959. Hearings, 86th Congress, 1st Session, on H. R. 10. An act to encourage the establishment of voluntary pension plans by self-employed individuals.* U. S. Govt. Print. Office, Washington, 1959, 406 pp.

31774. White House Conference on Aging. Planning Committee on Impact of Inflation on Retired Persons. (G. Warfield Hobbs, Chairman): *Background paper on impact of inflation on retired persons.* The Committee, Washington, July 1960, 56 pp. (Mimeogr.).

31775. Wick, W. A.: The Senior Men's Bureau of the Cedar Rapids Chamber of Commerce. *Newsletter* (*Geront. Soc.*), 7: 19; 26, 1960.

31776. Anonymous: The evolution of State pension schemes in Great Britain. *Int. Labour Rev., 81*: 456-479, 1960.

See also Nos. 31766, 31767, 31836.

V. Education
(adult)

31777. Andrus, E. P.: Education as the retired see it. *Adult Leadership, 9*: 23; 35, May 1960.

31778. Davis, G. E.: Education for aging. *Adult Leadership, 9*: 2; 25, May 1960.

31779. Donahue, W., and H. L. Orbach: Training in social gerontology. *Adult Leadership, 9*: 3-5; 26, May 1960.

31780. Gardner, D. H.: Education for the aging in Canada. *Adult Leadership, 9*: 21-22; 35, May 1960.

31781. Kinne, L. M.: The role of the volunteer agency in education for the aging. *Adult Leadership, 9*: 12-13; 30, May 1960.

31782. Rabe, H. F.: The role of the public school in education for the aging and aged. *Adult Leadership, 9*: 6-7; 26-27, May 1960.

31783. Stafford, V.: Role of the church in education for the aging. *Adult Leadership, 9*: 16; 33, May 1960.

31784. Tarcher, M.: The role of business in education for aging. *Adult Leadership, 9*: 17-18; 33-34, May 1960.

31785. Tibbitts,C.: The federal government in education and aging. *Adult Leadership, 9*: 19-20; 34, May 1960.

31786. White House Conference on Aging. Planning Committee on Education for Aging. (George E. Davis, Chairman): *Background paper on education for aging.* The Committee, Washington, March 1960, 146 pp. (Mimeogr.).

31787. White House Conference on Aging. Planning Committee on Role and Training of Professional Personnel. (Wilma Donahue, Chairman): *Background paper on role and training of professional personnel.* The Committee, Washington, May 1960, 144 pp. (Mimeogr.).

31788. Wilson, H. S.: Educational programs and services of colleges and universities related to the aging and aged. *Adult Leadership, 9*: 8-9; 27-28, May 1960.

31789. Yoho, R.: The role of the health educator in education of the aged. *Adult Leadership, 9*: 14; 31, May 1960.

See also No. 31762.

VI. Housing and Care

31790. Entman, S.: A new look at the home for the aged. *Newsletter* (*Geront. Soc.*), 7: 22-23; 26, 1960.

31791. Farber, A.: Medical, nursing, recreational and personal adjustment programs for a small institution for the aged and chronically ill. *J. Amer. geriat. Soc.*, 8: 724-735, 1960.

31792. Goldfarb, A. I.: Homes for the aged—helpful or harmful to the mentally ill residents? *Newsletter* (*Geront. Soc.*), 7: 20-21; 25, 1960.

31793. Lacombe, S.: Perspectives de l'action sociale des caisses vieillesse. Dans le cadre du decret du 25 Septembre 1959. *Rev. franç. Géront., 6*: 257-259, 1960.

31794. Metrop. Life Insur. Co.: Living arrangements and mobility of the aged. *Statist. Bull. Metrop. Life Insur. Co., 41*: 6-8, Aug. 1960.

31795. U. S. Department of Health, Education and Welfare. Special Staff on Aging: *The aging population; marital, family, and household status, 1959.* U. S. Govt. Print. Office, Washington, April 1960, Fact Sheet No. 3, 4 pp. (Mimeogr.).

31796. Various: *Homes for the aged—their place in the community; responsibility to residents.* Ill. Ass. of Homes for Aged and Seminar Comm. Welf. Counc. Metrop. Chicago, Chicago, Ill., 1960, Proc. Eighth Ann. Inst., 68 pp. (Mimeogr.).

31797. White House Conference on Aging. Committee on Housing. (Walter C. Nelson, Chairman): *Background paper on housing.* The Committee, Washington, March 1960, 73 pp. (Mimeogr.).

See also Nos. 31621, 31806.

VII. Medical Care

31798. Edstrom, E.: Most aged persons eager to pay own way for medicine if they can. *Retirement Life*, 35: (8), 14-15, 1960.

31799. Hazell, K.: *Social and medical problems of the elderly.* Hutchinson Med. Publ., London, 1960, xiii, 216 pp.

31800. Koetting, F. A.: Economic aspects and old age assistance programs. Chap. 16 *in*: M. J. Hirsch and R. E. Wick (Editors), *Vision of the Aging Patient.* Chilton Co., Philadelphia, 1960, pp. 280-294.

31801. Luck, M. G., N. B. Belloc, and F. E. Hesse: *Hospital experience of a California city.* Dept. of Publ. Hlth., State of Calif., Berkeley, March 1959, 49 pp. (Mimeogr.).

See also Nos. 31625, 31831, 31833.

IX. Social Problems
(includes social adjustment)

31802. American Public Welfare Association: *Social service needs of older people and the role of public welfare in meeting these needs.* The Association, Chicago, Feb. 1960, 20 pp.

31803. Chicago. Joint Council to Improve the Health Care of the Aged: *First National Conference. . . Proceedings, Washington, D. C., June 12-13, 1959.* The Council, Chicago, 1959, 180 pp.

31804. Cowgill, D. O., W. L. Parris, V. A. Bunn, and N. Baulch: *Our senior citizens. (Revised edition).* Univ. of Wichita and Comm. Planning Counc., Wichita, Kansas, 1960, 84 pp. (Mimeogr.).

31805. Kansas State Board of Health: *Characteristics of the population over 65 years of age in Kansas.* The Board, Topeka, 1959, 53 pp. (processed).

31806. Kansas State Board of Health: *Characteristics of residents in a sample of care homes for the aging in Kansas.* The Board, Topeka, 1959, ii, 27 pp. (processed).

31807. Kansas State Board of Health. Division of Health Education Services: *Health and medical care characteristics of the aging in Kansas.* The Division, Topeka, 1960, 33 pp. (processed).

31808. Louisiana Commission on Aging: *"Oscar Oldtimer" sez: "Read this." Handbook for Advisory Councils on Aging.* The Commission, Baton Rouge, no date, Publ. No. 5, 20 pp.

31809. Maryland (State of). Coordinating Commission on Problems of the Aging: *Recommendations of the State of Maryland for consideration of the White House Conference on Aging, January 9-12, 1961.* The Commission, Baltimore, Sept. 1960, 21 pp. (Mimeogr.).

31810. New Jersey State Division of Aging: *Paterson—a survey of aging; their numbers, their needs.* The Division, Trenton, no date, 22 pp.

31811. New York Guild for the Jewish Blind: *Proceedings, the third institute. The specialized agency; focal point in bettering community service. Panels I, II, III, IV.* The Guild, New York, Feb. 21, 1958, 78 pp. (Mimeogr.).

31812. Pennsylvania Department of Public Welfare. Office for the Aging (Editors): *Pennsylvania guide for county surveys.* Governor's White House Conf. Comm. on Aging, Harrisburg, Feb. 1960, 73 pp.

31813. Scardigli, G.: L'importanza delle fonti di informazione per le ricerche sociali. (Editoriale). *Gior. Geront., 8*: 299-304, 1960.

31814. Tibbitts, C.: Social gerontology; a new approach to understanding aging. *Geriatics, 15*: 705-716, 1960.

31815. Townsend, P.: Social surveys of old age in Great Britain, 1945-58. *Bull. World Hlth. Org., 21*: 583-591, 1959.

31816. U. S. Senate. Committee on Labor and Public Welfare: *The aged and aging in the United States; a national problem. A resolution authorizing a study of the problems of the aged and aging with minority views. A report by the subcommittee on problems of the aged and aging. Pursuant to S. Res. 65. 86th Congress, first session.* U. S. Govt. Print. Office, Washington, 1960, vii, 186 pp.; A155 pp.

31817. White House Conference on Aging. Planning Committee on State Organization. (Brevard Chrihfield, Chairman): *Background paper on state organization.* The Committee, Washington, April 1960, 34 pp. (Mimeogr.).

31818. Willing, S.: A study of the adjustment of persons over sixty-five years of age in the five boroughs of the city of New York by small sampling technique. *Disserta. Abstr., 20*: 398, 1959.

31819. Wisconsin State Department of Public Welfare: *Welfare serves the aging.* The Department, Madison, 1960, 10 pp. (Mimeogr.).

See also Nos. 31374, 31564, 31645, 31749.

X. Social Groups

31820. Jureček, Z.: (The age of brides and bridegrooms in relation to marital fertility.) *Demografie, Prague, 2*: 9-24, 1960.

31821. Pollak, O.: Interrelationships between economic institutions and the family. *Soc. Sec. Bull., 23*: 9-15, Oct. 1960.

31822. Shanas, E.: Family responsibility and the health of older people. *J. Geront., 15*: 408-411, 1960.

31823. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Marriage and divorce Statistics. Sect. 2 *in*: *Vital Statistics of the United States 1958.* U. S. Govt. Print. Office, Washington, 1960, pp. 1-31.

31824. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Detailed marriage statistics for the marriage-registration area. Sect. 9 *in*: *Vital Statistics of the United States 1958.* U. S. Govt. Print. Office, Washington, 1960, pp. 73-100.

31825. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Detailed divorce and annulment statistics for the divorce-registration area. Sect. 10 *in*: *Vital Statistics of the United States 1958.* U. S. Govt. Print. Office, Washington, 1960, pp. 101-111.

31826. U. S. Department of Health, Education and Welfare. Social Security Administration. Division of Program Research. (By Alvin L. Schorr): *Filial responsibility . . . in the modern American family.* U. S. Govt. Print. Office, Washington, June 1960, v, 45 pp.

31827. White House Conference on Aging. Planning Committee on Family Life, Family Relationships, and Friends. (Mrs. Margaret Allen Ireland, Chairman): *Background paper on family life, family relationships, and friends.* The Committee, Washington, April 1960, 62 pp. (Mimeogr.).

See also Nos. 31724, 31783, 31795.

XI. Social Security

31828. Futterman, J. S.: Some techniques of management improvement in the administration of social security in the United States. *Bull. int. Soc. Sec. Ass., —:* 176-203, Apr.-May 1960.

31829. Hougham, G. M.: *Economic security for the aged in the United States and Canada.* Canad. Welf. Counc., Ottawa, Oct. 1959, ii, 82 pp. (processed).

31830. Iowa State Department of Social Welfare: Responsibility of relative set forth in Iowa laws. *Bull. inst. Geront. (State Univ. Iowa), 7*: (Suppl. 8), 3-7, Aug. 1960.

31831. Leake, C. D.: Social security medical care for the aged. (Editorial). *Geriatrics, 15*: 730, 1960.

31832. Myers, R. J.: *Methodology involved in developing long-range cost estimates for the old-age, survivors, and disability insurance system.* Soc. Sec. Adm., Washington, May 1959, Actuarial Study No. 49, ii, 56, 10, 3 pp. (processed).

31833. Shermack, A. P.: Colorado's old age pension medical plan. *Rocky Mtn. med. J.*, 57: 54-58, 1960.

31834. U. S. Congress. House. Committee on Ways and Means: *Social security amendments of 1960. Hearings, 86th Congress, 2d session, House report 1799 on H. R. 12580.* U. S. Govt. Print. Office, Washington, 1960, 336 pp.

31835. U. S. Department of Health, Education and Welfare. Library: *Basic readings in social security. 25th anniversary of the Social Security Act, 1935-1960.* U. S. Govt. Print. Office, Washington, 1960, Publ. No. 28, vi, 221 pp.

31836. U. S. Department of Health, Education and Welfare. Social Security Administration: Old-age and survivors insurance; a report on the retirement test. *Soc. Sec. Bull.*, 23: 4-8, Oct. 1960.

31837. U. S. Department of Health, Education and Welfare. Social Security Administration. Bureau of Old-Age and Survivors Insurance: *Social security handbook; on old-age, survivors, and disability insurance.* U. S. Govt. Print. Office, Washington, 1960, v, 261 pp.

31838. Anonymous: Social security in Czechoslovakia. *Bull. int. Soc. Sec. Ass.*, —: 81-131, March 1960.

31839. Anonymous: Social security protection for members of farmers' co-operatives in Eastern Europe. *Int. Labour Rev., 81*: 319-334, 1960.

See also Nos. 31800, 31826.

XII. Social Services and Soial Work

(Recreation and social aspects of rehabilitation. Medical rehabilitation under Geriatics, Medical Care)

31840. American Medical Association: Report of conference on personal care in homemaker services. *Homemaker serv. Bull., 1*: 1-4, July 1960.

31841. American Medical Association: The homemaker and personal care. *Homemaker serv. Bull., 1*: 1-4, Sept. 1960.

31842. Collins, P., J. Marshall, and D. A. Shaw: Social rehabilitation following cerebrovascular accidents. *Gerontologia Clin.*, 2: 246-256, 1960.

31843. Dauvergne, M.: L'aide ménagère aux personnes agées. *Rev. franç. Géront.*, 6: 357-359, 1960.

31844. Florea, A.: Un contributo del servizio sociale per la prevenzione della crisi dell'anziano nella società moderna italiana. *Gior. Geront.*, 8: 425-432, 1960.

31845. Kaplan, J.: Evaluation techniques for older groups. *Amer. J. occup. Ther., 13*: 222-225, 1959.

31846. Leavitt, C. M.: Geriatic patients develop their own O. T. area. *Ment. Hosp., 10*: 16-17, Oct. 1959.

31847. U. S. Department of Health, Education and Welfare. Public Health Service. Division of Public Health Methods: *Homemaker services in the United States; report of the 1959 conference.* U. S. Govt. Print. Office, Washington, 1960, PHS Publ. No. 746, 257 pp. Abstr: *Soc. Sec. Bull.*, 23: 16-17, Oct. 1960.

See also Nos. 31631, 31802.